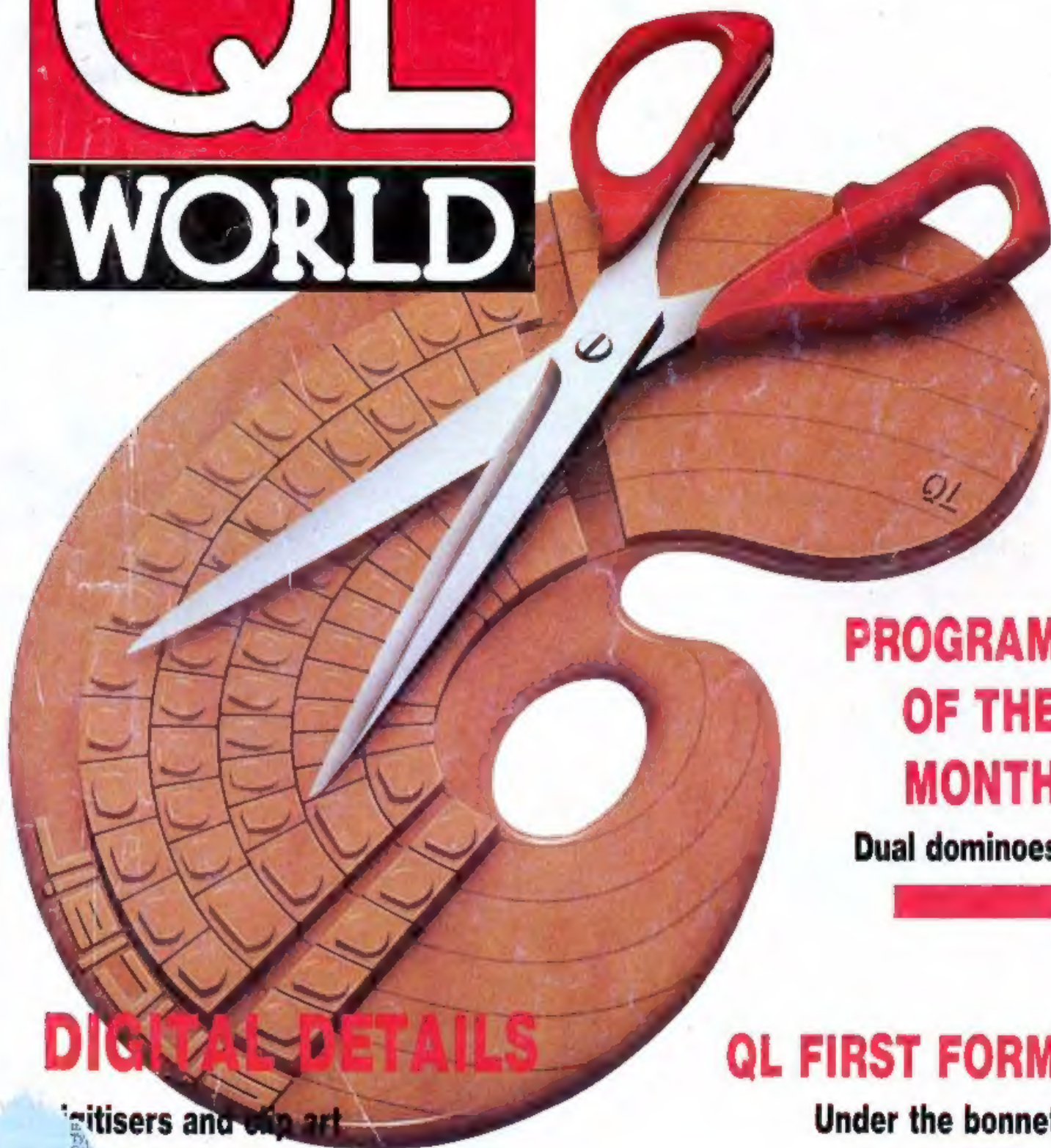


S I N C L A I R

Every month £1.45 August 1988

# QL WORLD



## PROGRAM OF THE MONTH

Dual dominoes

---

## DIGITAL DETAILS

Digitisers and clip art

---

## QL FIRST FORM

Under the bonnet

---

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## NEXT MONTH

### Lightning has struck

A review of Digital Precision's Lightning is in the bag and ready to strike.

### SuperBasic

Mike Lloyd goes more deeply into sorting routines for the QL.

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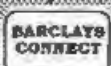
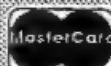
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# QL

# S C E N E

## European QL Fair

The QL Users' Group of Limberg in Belgium — Sinclair QL Gebruikers Groep Limburg — is organising and promoting an international QL day at De Borggraaf Hotel, Hasselt, on October 23. The aim is to bring together supporters of the QL in Europe and to give rise to further QL days in subsequent years in other parts of Europe to maintain the contact. A further aim is to set up an international QL users' databank and ultimately an international QL/Thor users' organisation.

The Limberg group is canvassing support from software and hardware suppliers and wants QL user groups and publications to publicise the International QL Day in any way they are able. A number of major QL suppliers have already indicated that they will attend.

A draft program of demonstrations, lectures and forums too long for QL Scene to reproduce has already been drawn up and information about hotels and accommodation in Limberg, including De Borggraaf, is available. Hasselt is the county town of the province of Limburg and is near to a number of major road links.

For information about QL Day, contact the QL Users' Group Limberg, M. Beckers, Houterstraat 100, 3762 Gellick, Belgium.

## No-charge Supercharge

Following the announcement of *Special Edition Supercharge*, Digital Precision would like to make it

clear that there are now no royalty restrictions on the use of output from any of the company's products.

## PDQL makes conversions to the QL disk cause

DiscOVER is the new program to be released from PDQL, which permits the conversion of text and data files between the QL format, and an alien format in either direction. The version of the program for conversion to and from IBM PC format is available

now for £29.50, with a multi-format version with CP/M and BBC format conversion facilities to follow soon, costing £39. PDQL is planning to add other alien format conversion routines to the multi-format version in the future.

PDQL has announced

that the first 50 registered buyers of the IBM version of *DiscOVER* will be entitled to a free upgrade of the multi-format version on application to PDQL up to August 30, 1988. Enquiries to PDQL, Unit 1, Heaton House, Camden Street, Birmingham B1 3BZ.

## Sector index to success

Sector Software has released a complete computerised index to *QL World* and *QL User*. The 150K database is compressed to run on an unexpanded QL and, Sector says, it can search under a number of headings and takes about one second to find any item. Costing £6, the program is available on Microdrive or disc.

Sector has also brought into being a bulletin board "mainly for the QL, with some features on the Z-88", according to David Batty. The bulletin board is available on the Sector telephone number, 0772 454328, at any time out of business hours, which is

usually from 6 pm to 9 am Mondays to Fridays, and all weekends and bank holidays. The Prestel-style board will carry reviews and information and allow users to leave messages.

Sector Software, 39 Wray Crescent, Ulmes Walton, Leyland, Lancs PR5 3NA.

## DP draw wins a huge response

The Digital Precision prize draw took place under the watchful eye of Leslie Fahidy of *QL World*. The computer in charge considered its task for somewhat less than seven million years and in due course produced 84 names of QL users from Switzerland to Strathclyde who will be offered a free

copy of either *Editor* or *Supercharge*, or a choice of half-price packages, as well as discounts on other DP software. The total value of the prizes is over £2,500.

"We set up the prize draw some time ago," said Freddie Vachha of DP, "so this should be a pleasant surprise to 84 people."



# OPEN CHANNEL

Open Channel is where you have the opportunity to voice your opinions in *Sinclair QL World*. Whether you want to ask for help with a technical problem, provide somebody

with the answer, or just sound off about something which bothers you, write to: Open Channel, Sinclair QL World, Greencoast House, Francis Street, London SW1P 1DG.

## Interesting

It was interesting to read Bryan Davies' article on the inner workings of the QL, in particular his observations concerning microdrives. I have always had about 220 sectors on new cartridges except the few through the years which have been faulty, so by his suggested standards my drives seem to be satisfactory but here is a thought which might reduce the number of data losses for anybody who has such problems.

Most experienced users will tell you that if you format a new cartridge a

number of times you will get an increasing number of available sectors. There are two factors to be taken into consideration. First, you need to know that the contents of any cartridge may be transferred to any other "normal" cartridge in your library. It is safer to work on a basis of around 210 sectors maximum as a standard. This, of course, should be taken as a lesser figure if you do not achieve the 220 on average in the first place.

The second point is far more important and I feel that it might have contributed to my comparative lack of microdrive problems. Far from squeezing the maximum number of

sectors out of a given cartridge it is much better to settle for a reduced number. Thus when I format my cartridges my format program cycles through the process five times; this displays the number of good sectors each time.

Providing the last three times gives a constant figure, so long as it is 210 sectors or over, I accept it as a normal cartridge. If there is a variation in the available sectors during the five format processes and the last three are no constant my formatting program provided the ability to re-format singly under my control. Then I reformat until a low sector count is given. Then, and only then, do I classify it as normal, provided that the low figure is 210 sectors or above.

This seems to be the only way to be reasonably sure that any border-line sectors are excluded. There is no virtue in getting the count high if it is not absolutely reliable.

I enclose a copy of the very simple program used for this purpose and hope

that it might prove useful.

It should be stressed, though, that there is no substitute for prudently keeping copies of all your work. It is the way professional computer installations maintain their reliability. The fact that you effectively buy two cartridges to store what can be recorded on one soon becomes economic. You don't have to lose much painstaking work to make this clear.

Contrary to early reactions, microdrives are very reliable and operate on an extremely clever principle in which the oxide surface gets far less wear than the current design of floppy discs. Those whom I have heard complaining about their unreliability have always been people who have lost data which was not backed-up.

The prime consideration is speed and volume. If one really must have these two qualities, buy floppy discs, but where do you buy a computer with two discs from around £150?

P. J. Winnall,  
Sheffield.

## Editor's notebook

THE news that the Thor is finally to be promoted as a business computer across Europe and behind the Iron Curtain can only be encouraging news. The new company formed jointly by Densoft and CST, Thor International, is expecting to sell the Thor XVI in several configurations, manufactured in Wales and later in the Soviet Union for sale in Western Europe.

This is businesslike talk and the arranging of an introductory presentation for the press and QL dealers is a sign of serious commitment by the people concerned. On the other hand, the two days' notice *QL World* was given of the meeting, and the fact that the exhibition model of the Thor arrived at the venue two hours late — too late for pictures to accompany the report on page 18 — is less encouraging.

If the venture is to work, the participants must move one step ahead of the waiting world, not two hours behind it.

SOON I shall be looking for users to write reports for *QL World* on items of hardware they use. We shall probably begin with printers. If you would like to write about your printer, write to *QL World* for details of what we need, telling us the model and how long you have had it.

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100 REMark ***** FORMAT CARTRIDGE *****
105 REMark Copyright P. J. Winnall 1988
107 REMark Runs in high or low resolution mode.
110 :
120 BORDER#0,1,2: CLS#0: CLS#1
130 INPUT#0,'Drive Number ';&d$
140 INPUT#0,'Cartridge name(including extension) ';&name$
150 &d$='adv' & &d$ & ' '
160 REPEAT loop
170   FOR j=1 TO 5
180     FORMAT &d$ & &name$
190   END FOR j
200   DIR &d$ & &name$
210   CLS#0: PRINT#0,'Reformat y/n '
220   inp$=INKEY$(#0,-1)
230   IF inp$='n' OR inp$='N' THEN EXIT loop
240   IF inp$<>'y' OR inp$<>'Y' THEN j=5: GO TO 180
250 END REPEAT loop
260 CLS#0: PRINT#0,'End of Formatting. Re-run for further
   cartridges.'
270 STOP
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# DIY TOOLKIT



## This month Simon Goodwin covers the commonest errors in QL Toolkit Code

**S**ince the QL launch in 1984 I have written more than 200 toolkit routines and spent a good deal of time disassembling and testing other people's code. In the process I have found the same few mistakes occurring time and again, which is why I have compiled a list of the 10 commonest errors in QL toolkit code.

This article deals with minor details, the things which make the difference between programs which work and programs which do not. If you have been reading DIY Toolkit for a time it should all make sense, especially if you have tried writing your own toolkit commands. Writing is easy; getting code to work is much more difficult. This article is an attempt to redress the balance.

You may find it useful to check your programs against this list. Many of the bugs are subtle and cause intermittent faults you may miss unless you check specifically for them. I discovered most of the mistakes listed when investigating the behaviour of published QL programs and commercial toolkits. I have tried to concentrate on problems which are difficult to spot and exceptional to the QL. I would be interested to hear of other QL quirks which readers find tricky.

The bugs tested in the following section are divided into three groups — addressing bugs which concern the way memory is accessed; coding bugs which stem from the way code is written; and stack bugs which can occur inside resident functions.

The classic QL bug is probably the odd address error. It is easiest to recognise when running SuperBasic at the same time as a faulty task, perhaps one which has been only partly copied.

Suddenly the cursor blinks unevenly; stripes of 'noise' appear on a TV display, usually a sign that the QL is in a tight loop in internal memory; and characters you type appear in fits and starts. This usually means an address error has occurred.

## Strange rule

If you try to store a two- or four-byte value in memory the QL will let you put it at only an even memory address. This rule seems strange if you are used to programming an older 8-bit processor, like the Z-80 or 6502, because they let you put words at any address, odd or even.

The QL 68008 processor is still 8-bit; in other words, it writes 16-bit words in two halves but it is fussy because it is designed to be upwards-compatible with the faster 68000 used in the Thor XVI, Atari ST, Amiga and Apple Macintosh, which writes 16 bits at a time.

The 68000 stores both bytes of a word at the same time. The most significant eight bits of a word — the first digits when you write the value on paper — are always stored at an even byte address. The least significant bits are stored at the next odd address.

The QL enforces the same rule, even though its 68008 chip addresses

bytes of memory individually rather than in pairs. The rule ensures that QL programs still work if you upgrade to a 16-bit chip, otherwise it might be impossible to run QL software on the 16-bit Thor XVI Super QL.

## Not practical

The processor can detect attempts to store a word, or a 32-bit long word, at an odd address. When that happens an 'address error' exception occurs and the processor jumps to a fixed location, normally in the QL ROM. The system tries to ignore the offending instruction and continue. This is not usually a very practical way to handle the problem but sometimes it is sufficient to enable you to recover from the error.

If an address error occurs in a task the machine will not crash but it becomes difficult to enter further commands. You may have met this situation in your experiments with EXEC. As usual, the processor shares its time between reading SuperBasic commands and running the task but an address error in a task means the QL keeps executing the same instruction over and over again and that disturbs multi-tasking. You must



Addresses are placed in the QL memory, referred to by number. Addresses start at 0 and continue to 1,048,575; one byte is stored at each address. Some address ranges are unused on most systems.

Buffers are areas of memory used when reading, writing and editing data.

Bugs are the observed consequences of inadequate software design.

Bytes are basic units of computer memory. Each byte can store one character or a number between 0 and 255. One byte is made up of eight bits, each of which can store the value 'TRUE' or 'FALSE' independently.

Machine code is the fast, pedantic programming language recognised by the processor chip in a computer.

Qdos is the name of the QL operating system, the program which runs as



remove the task with the address error in it to regain full control.

Even if your programs never suffer from address errors it is easy to demonstrate the problem by taking advantage of a feature of the EXEC command which I should really have included in my QL ROM bug lists. When EXEC loads a task it allocates two areas of memory — code space to store the 'code' from the file — and data space, initially an empty area used to store values computed by the code. Every task file has a data space which you can check and change using my routines in the February *QL World*.

## Dummy words

If the data space of a task is an odd number the QL ROM routine which makes space for tasks fails, giving an address error when it tries to put dummy words at the end of the task data area. You can try this by using the DIY Toolkit routine SetHEAD to give a task an odd dataspace and then loading the task. The bug is present in all QL ROMs.

You can also run into odd address errors if you are careless when using Marcus Jeffrey's string PEEK and POKE routines from the first series of

DIY Toolkit.

Jeffrey failed to make sure that the address used when reading and writing strings was even, although he kept a word length value at the start of each string. To fix this bug, add these lines after lines 31 and 56 of the listing on page 42 of the August 1987 *QL World*:

MOVE.W	A4,DO	; Get ready to check address
BTST	#0,DO	; Test odd/even bit
BEQ.S	EVEN	; OK if bit is zero
MOVEQ	#-15,DO	; BAD PARAMETER error
RTS		
EVEN		

Many QL ROM routines expect you to supply the address of a data table or a string; if the data starts with a word value you must make sure it is at an even address, because the QL ROM probably will not check this for you. You should always check that values, or offsets, supplied by the user are even before you use them to address words in memory. The check is fast and simple but without it the simplest typing mistake could stop your task or toolkit in its tracks.

It is important to make sure that you try a few odd values when testing routines to make sure they handle them properly. It is not sufficient to test a program with the values you

know it expects; other users may not know the things you take for granted.

Machine code monitors, like Tony Tebby's excellent QMON, contain facilities to trap faults like address errors. When such an error occurs QMON stops the task, prints a message and waits for you to fix the problem by examining and editing

the code. This is often easier said than done but at least the monitor lets you know what has happened and tells you where to look.

QL programmers are often tempted to assume that addresses used by the operating system are fixed. Some people use PEEK(163879) to check the code of the last key pressed. That reads the system variable SV.ARBUR, which is stored as the 140th byte in the QL system variables area.

Normally system variables are stored from address 163840 onwards, so the PEEK works but the Qdos specification says that the variables



# INDEX OF TERMS



soon as you turn on the computer. The name is derived from QL Disc Operating System, even though the standard QL has no discs. Many computer operating systems have names ending with DOS. The most common are MS-DOS and PC-DOS for IBM micros but in the last decade I have seen AmigaDOS, AMS-DOS, DOS, DOS-PLUS, LDOS, MULTI-DOS, NEW-DOS, SDOS and TRS-DOS.

Sinclair probably chose the name Qdos because it is a pun on kudos, the Greek word for glory. The word kudos was fashionable when ancient Greek literature was in vogue and remains trendy among the highbrows of Cambridge.

**Resident** procedures are the commands you can enter at your QL keyboard when using SuperBasic. In this series we explain how you can add new functions and commands to the QL repertoire.

**A Stack** is an area of memory where values can be stored; the memory is

accessed in such a way that the last value put into the area is the first one you can take out; the first value stored cannot be retrieved until all values stored after it have been removed. You can think of it like a stack of plates.

Stacks in QL memory normally start at high addresses and grow towards lower addresses as values are stored. Luckily there is no concept of gravity inside a QL.

**System Variables** are areas of memory containing details of what the computer is doing and where it keeps other data. The standard QL has two sets of system variables — Qdos system variables concerned with tasks and devices and SuperBasic system variables concerned with commands and the current Basic program.

SuperBasic system variables record things like the last program line number encountered (BV.LINEUM); the address of the pro-

gram (BV.PFBAS); the address of variable values (BV.VVBAS); and so on. All addresses are offsets from the start of the Basic system variables, normally held in register A6. The whole Basic area can be moved round memory; so long as the value of A6 reflects the new start address all the address offsets can stay the same.

Qdos system variables record things like the first address of unused memory (SV.FREE); the address of the table of addresses of tasks (SV.JBBAS); whether or not BEEP is making a noise (SV.SOUND); and other information about the facilities the computer provides for the user. Addresses among the Qdos system variables are absolute rather than offsets, as they refer, in general, to things which do not move round memory.

There is a full table of system variable names and offsets in Andy Pennell's highly-recommended *Sinclair Qdos Companion*, which is published by Sunshine Books and unfortunately is out of print now.

can be anywhere in memory, depending on the system.

Your programs may not work on new Qdos systems if they assume that the variables are at 163840, without asking. The Thor 20 and Thor 16 computers move the variables into faster memory, so programs which access the system variables will not run on a Thor unless they call Qdos to find the new location of the variables. The Qdos routine MT.INF puts the address of any machine system variables in register A0.

Even worse, some programs use PEEKs and POKEs to access information in the QL channel tables. In the early days of the QL I often found code which changed the character set in a particular window by POKEing a new font address. The programmers worked out the correct place to POKE by experiment and then built the value into the program.

## Dangerous

This kind of trial and error is very dangerous on a multi-tasking, redefinable machine like the QL. When you turn on a QL it checks the amount of memory fitted and builds tables to keep track of file buffers, tasks and channel details. The data locations vary as channels are opened and closed and when window management utilities like QRAM take charge.

The result is that you cannot assume that anything in a QL system has a fixed address. You must use the operating system to find things for you; after all, that is what large amounts of it are for.

If you want to change the details of a window you should use the correct system call, giving Qdos a channel identifier and letting it work out where the window details are stored. SD.FOUNT lets you set the address of the font in a way which will work regardless of the configuration of the computer running the program.

The QL operating system Qdos makes special use of two address registers and it is easy to be caught if you forget what the system thinks you are doing. The significance of registers A6 and A7 varies, depending on the context of the code using them. Single instructions like TRAP or AND.W \$5551,SR can change the value of these registers and when there are two conventional meanings for each value it is easy to assume that they have the meaning you want when in fact they do not. The machine is normally in supervisor mode when in system routines like device drivers and other code accessed via TRAP instructions. At that

time A6 contains the address of the start of the Qdos system variables.

When in user mode — in task code like the SuperBasic interpreter rather than operating system code — A6 normally contains the start address of Basic system variables when in user mode. This address can change at any time, as other tasks ask for memory, but the Basic system variables move with it so it is always a valid address.

You can still find the Qdos variables when in user mode by calling MT.INF. This leaves A6

**“This kind of trial and error is very dangerous on a multitasking, redefinable machine like the QL.”**



unchanged but puts the address of the system variables in A0. Do not call MT.INF and use Qdos offsets on A6.

## Stack TRAP

To make things even more difficult, there are two registers called A7 inside the QL. Much like A6, one is used in system code, the Supervisor Stack pointer, and one in tasks, the User Stack pointer. They are swapped whenever the 68008 finds a TRAP, error or external interrupt signal. They swap back when instructions like RTE or AND.W \$5551,SR are executed. This means you cannot pass parameters by storing them on the stack if you are calling a routine with a TRAP.

Some data addresses, particularly areas of memory used by SuperBasic, may change at any time. SuperBasic

data — the program, variables, stacks and tables — can move without warning between any one instruction and the next. Machine code can still access data by using offsets inside the SuperBasic area; wherever Basic happens to be inside routines it uses, A6 points to the start of the Basic area. Addresses held in that area must be offsets from the value in A6, so that they are still valid if Basic is moved.

If you forget this you can run into two problems. The first is when you treat an offset as an address. To find the length of the first procedure name known to Basic you must use:

```
MOVE.L BV.NLBAS(A6) ,AO
MOVE.B O(AO,A6,L) ,DO
```

If you entered mistakenly:

```
MOVE.L BV.NLBAS(A6) ,AO
MOVE.B (AO) ,DO
```

you would almost certainly miss Basic completely, because the second line forgets that A6 is part of the address.

A more difficult problem occurs if you are tempted to add A6 to the offset, to use faster or more flexible instructions. To add the codes of 10 bytes inside the SuperBasic area, advancing from the offset in A5 you must write:

```
MOVEQ #10-1,D1
MOVEQ #0,D2
LOOP ADD.B O(A5,A5),D2
ADDQ.L #1,A5
DBRA D1,LOOP
```

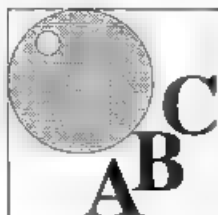
The double index in that loop makes it about half the speed of this code, which adds A6 to the offset once and for all:

```
ADD.L A6,A5
MOVEQ #10-1,D1
LOOP MOVEQ #0,D2
ADD.B (A5)+,D2
DBRA D1,LOOP
```

Unfortunately the second version will not work reliably, because the value of A6 may change at any time when another task interrupts Basic. If the value changed during those ADD instructions they would read incorrect bytes and all kinds of unpredictable errors could occur. Sooner or later this code would crash your QL, although it might seem to work for a time.

*Simon Goodwin will continue this article in the September edition of QL World.*





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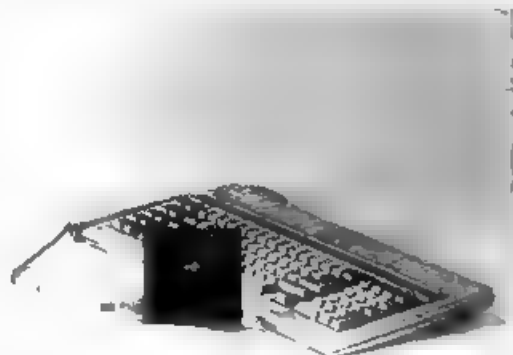
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CTRL <	delete word left (in editors only)
CTRL SHIFT <	delete whole line (in editors only)
SHIFT <	cursor to start of line (in editors only)

There are five new function-keys:

F6	SHIFT F1
F7	SHIFT F2
F8	SHIFT F3
F9	SHIFT F4
F10	SHIFT F5
CTRL SPACE	BREAK
SCROLL LOCK	CTRL F3
NUM LOCK toggles the state of the NUMLOCK LED.	

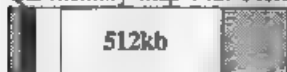
This controls the function of the numerical pad. Is NUMLOCK on, then a keypress on it generates the numbers and characters shown at the keys, otherwise

<b>ARROW KEYS</b>	<b>CURSOR CONTROL</b>
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END	Cursor to end of line (in editors only)
PAGE	UP Scroll up one page (in editors only)
PAGE	DOWN Scroll down one page (in editors only)
DEL	Delete character under cursor
DN5	ALT ENTER (with SuperToolbox II)
CTRL -	program slow down
CTRL +	program speed up
SYSREQ	Job-change (function of CTRL C)
CTRL PRISC	toggles MODE 4 and MODE 8
ALT SHIFT SYSREQ	Level 7 interrupt (CTRL ALT 7 at the QL)
PRISC	s.u.
ALT SHIFT PRISC	RESET

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QLW8

# Thor goes East

In this report, Leslie Fahidy tells of the major improvements to the Thor, and of plans to take it as far as the Soviet Union.

The Thor, which originally was an alternative, improved version of the QL, has been with us for some time. In spite of that, apart from regular users of the computer from Cambridge Systems Technology, nobody seems to know much about it. Only a few days ago I was talking to a

friend and in discussing the Thor we agreed that we were at a loss to understand why CST is not making a better show of promoting it.

## Powerful machine

It is potentially a very powerful machine. I am not sure whether I would not opt for the Thor in preference to a PC but the

company is not doing much to bring it to the attention of potential users. I have learned that all this may change in the near future. CST and Dansoft have adventurous plans for the computer which derives its name from one of the senior gods in Scandinavian mythology.

CST has joined forces with Dansoft, a Danish

software house of high reputation, and formed Thor International, with a 50 percent interest from both participating companies, for the purpose of creating a new image for the Thor and to promote its sale internationally as a serious business computer.

Hellmouth Stuvén of Dansoft and Julian Grisley and David Oliver of CST

## Simon Goodwin takes us on a guided tour of the 27th ZX Microfair at the Royal Horticultural Hall in London...

### ZX MICROFAIR

The QL family of computers made a strong showing at the ZX Microfair, in London.

Thames. The sunny weather and Nelson Mandela's birthday celebrations kept the crowds down, except at the start of the day, but the show was still busy until late afternoon.

Microfairs are a Sinclair tradition — a cross between a car boot sale and a computer show, where third-party hardware and software suppliers can pile trestle tables with old stock, meet their customers and launch new products to

enthusiastic visitors.

Microfairs are also a good source of rare and minority-interest products — adapters, cables, utilities, business programs and educational software. There is a keen trade in second-hand items, so it is a good place to go if you have just upgraded and want to sell your old equipment or you are looking for a bargain.

The show covers all the Sinclair computers, including the ZX range and Z-88, but 25 of the 70 firms at the fair were QL specialists. You could buy virtually all the well-known QL programs and add-ons and a few obscure items as well.

New QLs started the day selling at £80, with second-hand systems for £60. These sold out quickly and prices rose to £100 by the end of the fair. The bargain of the show for many users with unexpanded QLs was a flood of ultra-cheap memory-expansion units.

In 1984, when the QL was first announced, one of the leading companies advertising hardware add-ons was Quest. It paid the price of its early start and was driven out of the market by other suppliers which produced smaller, simpler disc systems and memory units.

Unsold stocks of its 64K, 128K and 256K memory boards reached the Microfair at bargain prices: for a 64K board, £10 and £20 respectively for the larger sizes in metal boxes, all ready to plug into the end of a QL.

Microfairs have a reputation for this kind of bargain but they are also good places to see the latest products and compare advice from several sources. Of course, *QL World* had a stand, as did the user groups Quanta and QL-SUB.

### NEW THOR ARRIVES

The new CST Thor XVI seemed to be everywhere, running stalwarts of the QL software scene like *uSuperToolkit*, *Text 87*, *Speedscreen* and *One Per Desk Xchange* — a vast improvement on the QL Psion packages. Compatibility seemed, if anything, rather better than the Thor 1 and the true 68000 processor makes the machine stunningly fast.

At last the Thor XVI is attracting up interest outside the converted community of QL enthusiasts — vital, because is the future of the QL and a guarantee

of new software. The official launch took place two days after the Microfair, in the more salubrious surroundings of the Danish Embassy in London.

### QDOS ON THE QT

The Thor XVI was not the only QL clone on show. Strong Computer Systems had a prototype Atari ST QL emulator on display, having wrested it from the clutch of ex-Sinclair designer Tony Tebby and *uQL World* wordsmith Ron Massey.

The emulator was developed by Scandinavian software house Futura Datasenter — despite the name a firm unconnected with the Sandy aborted Super-QL. The QL emulator uses a collection of QL parts inside an Atari Mega ST box, limiting display speed and future supplies but ensuring high compatibility.

The ST/QL emulator uses the QL Qdos operating system, with minor tweaks to fit the ST hardware. Strong circumvent copyright problems by supplying the emulator with a patch disc. If you to take a copy of your own QL ROM:



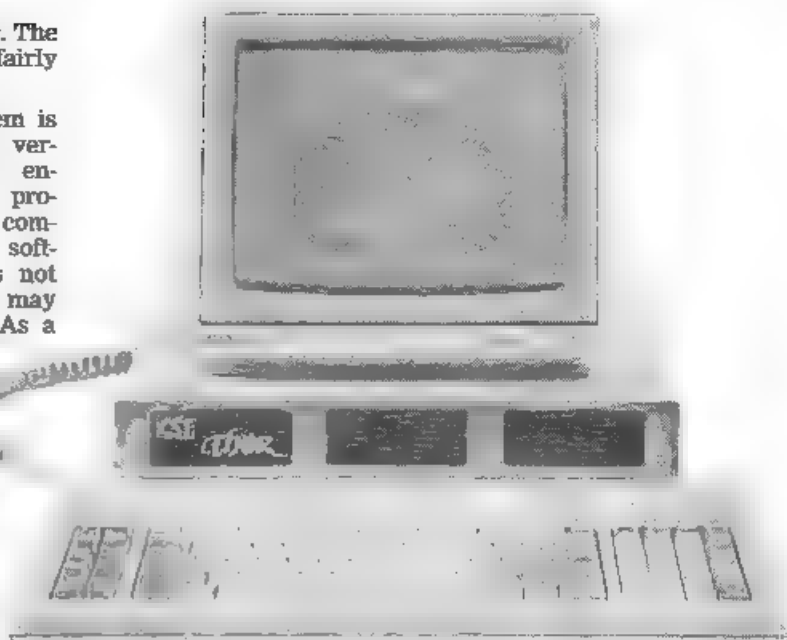
have outlined their ambitious plan for a series of new Thor computers. The Thor XVI series will be available in different configurations. The basic model will have double 720KB floppy drives, with memory which can be expanded internally to 6.5MB.

## Fluctuating prices

A hard disc may be added with either 20 or 40MB of storage. Because of fluctuating component prices they were unable to give prices for the different models but it is envisaged that the basic model will sell at £989 including VAT

but excluding monitor. The monitor is likely to be fairly expensive.

The operating system is an entirely re-written version, with many enhancements, of Qdos, providing upwards compatibility with QL software. The reverse is not true; Thor software may not run on the QL. As a matter of interest and to illustrate the increased ability of the new operating system Argos, Qdos is contained in 48KB of ROM; Argos occupies 128KB. The Thor XVI is based on the 8MHz



then use the patch disc to convert it for the ST. That way Strong avoid is the attention of Amstrad protecting the intellectual property they bought from Sinclair but stubbornly refuses to use.

Strong claims that the emulator runs QL software marginally faster than a Thor XVI: it is also a little cheaper, although it lacks the Thor bundled software. Prices start at £760 for a complete system with about 800K of free RAM. Tasks run two to three times faster than on a QL and can communicate directly with the ST disc, Midi and printer port. The prototype tended to crash unexpectedly but when it worked it worked very well.

## SANDY PROTOTYPES

Sandy had a prototype version of its Megaboard — a kind of SuperDuperQboard, with all the features of its SuperQboard, plus a 20 or 30 MB 'winchester' fixed disc, a full 1MB of RAM, battery-backed clock, mouse interface and ROM Speedscreen. Amazingly, the board is only one centimetre longer than the SuperQboard and uses

fewer components than the Quest 64K RAM. The price of the Megaboard will depend on the trade price of Winchester drives when Tony Tebby finishes the ROM software but should be near £600.

One of Sandy associate companies, Power Computing, was showing a prototype of a plug-in board which promises to run QL software on any IBM-compatible computer. The board holds a 68010 processor, with space for 2 or 4 MB of RAM and the option to replace the processor with a 32-bit 68020 or an Immos transputer. The first versions will work as powerful network controllers, using the OS/9 operating system, but later models should feature SMS-2, the Qdos-compatible operating system Tony Tebby developed originally for the Futura project.

## QJUMP Q-PAC

Tebby's software house, QJump, was much in evidence at the show, with a cheery line of staff ready to extol the virtues of QRAM, SuperToolkit, and other QJump classics. The latest addition to the range of add-ons for the Q-Pointer

system is Q-PAC 1. This collection of pop-up utilities arrived at the show at a special fair price of £19.95 — by the time you read this it will have risen by £10.

Q-PAC 1 extends the desk-top metaphor of QRAM with a set of desk accessories you can call up at any time while using the computer. There is yet another QL clock test, with an alarm, which pops messages on to your screen when time's up, and a system monitor which shows graphically how tasks are sharing the memory in your system.

The typewriter option sounds trivial but may be convenient when you are addressing envelopes, or adding footnotes to pre-printed text. As the name implies, it works like a correcting typewriter, letting you enter and edit single lines before sending them to the printer.

The documentation points out that the calendar lacks 'salacious illustrations', but it is still more impressive than you might expect. It can work out and display the calendar for any month since 9AD and takes the switch from Julian to Gregorian dates in its stride, so long as you are dealing with the history of England or Wales.

If you ask it to show September 1752 it prints a month of 19 days. After the second of that month people in England and Wales switched from the Julian calendar, invented by Julius Caesar, to Pope Gregory's revised calendar, which was 11 days ahead. QJump cannot be faulted for attention to detail.

The other goodie in Q-PAC 1 is a very precise calculator. The pop-up four-function calculator works much like the one supplied with Taskmaster, but uses its own maths package, capable of multiplying 20 digit numbers or values accurately with a four-digit decimal exponent. Even astronomers should be happy with this resolution.

Q-PTR has a comprehensive configuration program and the revised 'hotkey' interface lets you switch between tasks with ALT and a digit, just like the QRAM rival, Taskmaster. As I left the stand I heard murmurings about QRAM 2.

The 28th ZX Microfair will be held in the autumn and advertised in advance in *QL World*. If you live within reach of London and can spare a Saturday you can be sure it will be a treat for Sinclair and QL enthusiasts.

Motorola 68000 processor but plans are included to upgrade it to the 68020 and, possibly, improved versions of that chip.

## Perestroika

The ideas of glasnost and perestroika seem to have penetrated the computer market and as a result the venture will have certain common elements with the Soviet Union. The agreements have not yet been finalised but the company appears to be on target for signing a preliminary agreement.

Initially, production of the Thor will be undertaken by A.B. Electronics in South Wales and the target is to reach a production figure of 500 units per month. That arrangement will be gradually phased-out and production will be transferred to the Soviet Union, from where the Thor will be re-exported to Western European



markets. Dansoft and CST say there will be no problems with respect to export licences; they state that the 68000-based machines have already been cleared for export to Eastern Bloc countries. They hope clearance will arrive in time for the 68020 version.

Another potential source of difficulty is the likely reaction of Amstrad. Thor International does not expect any serious problems since it claims that not a line of code of the original Psion design is incorporated in the machine; Argos is recognisably different from Qdos. Amstrad,

however, is not likely to give up easily on the prospect of capturing a vast market in the East.

The Soviet market is not the only new proposition from Thor International. The aim is to make the machine truly international. There are plans to release versions specially tailored to all the major European languages, including Russian. The foreign language adaptations will involve changing the keyboard and the character set, as well as the prompts and screen messages. The makers aim to fit it to various software markets; one of them, the Ritzaus News Distribution Service, is already well-established in Denmark.

## Sufficient support

The Soviet co-operation is interesting but probably not crucial to the success of the Thor. The reaction from Amstrad is. Another important factor will be the

support offered by software developers. Dansoft, however, will be able to give sufficient software support to the project, at least initially.

The appearance of the Thor XVI may well have a secondary effect on the QL. One of the factors which prevents a number of business users acquiring the QL is the lack of upgrading. Admittedly, several Thor models have been available previously but their existence was known mainly to a handful of potential users, most of whom would be reading *Sinclair QL World*.

Another factor which may have an effect on the QL market concerns the availability of software. Even though software written for the Thor XVI will not, or may not, run on the QL — not even on the expanded QL with disc drives — either Dansoft or another software house is likely to undertake the task of re-writing some of the Thor software for the QL.

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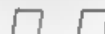
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Mike Lloyd, the expert who reviewed Speedscreen for QL World, has written to us saying that Lightning is a stunning utility. I have been knocked out by the improvements. Sounds unanimous ☒ us!

For full program specifications see the July edition of QL World

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# TECHNICAL HELPLINE

Paul Walton examines the versatility of the QL, looking at questions on multi-tasking, motor control and selective printing.

## RGB and sync

*C. Potter of Preston has bought a Victor monitor but says "the QL RGB output does not seem compatible with the pinouts shown for my monitor. Can I connect it and, if so, how?"*

The RGB output from the QL contains RGB, PAL and mono video outputs. Figure three shows the connections to make to the monitor for monochrome signals. The monitor has separate vertical and horizontal sync inputs, both of which can be connected to pin 4 on the QL. Care Electronics may be able to supply a suitable lead or you can make one yourself using the part numbers shown taken from the Maplin catalogue.

## Miss a page

*D. Shilliam of Ealing asks: I wonder if you know of any method which will enable me to print alternate pages of a Quill document?"*

The first step is to print the document to a file rather than to the printer. So when the PRINT command of Quill prompts with "to printer", type a file name instead. I have assumed that your document is page-numbered with "page" printed in italics before the number; that is the default DESIGN for Quill documents. I have also assumed that your printer is a dot matrix type and uses the

Figure 1.

```
100 CLS
110 INPUT "Enter filename ", fin$
120 OPEN #5, fin$
130 DELETE "adv2_temp.oit"
140 OPEN-NEW #6, "adv2_temp.oit"
150 REPEAT evenodd
160 INPUT "Select even or odd
pages (0/1): "; wanted
170 IF wanted = 0 OR wanted = 1
THEN EXIT evenodd
180 END REPEAT evenodd
190 PRINT "At End of File message,
type" "CLOSE#5: CLOSE#6"
200 PRINT "To print file, set up
printer and type" "COPY ADV2_temp.oit
TO SER1"
210 page = 1
220 end_of_page$ = CHR$(27) & "5"
230 REPEAT rd_file
240 INPUT #5, is
250 IF wanted THEN PRINT #6, is
260 IF end_of_page$ INSTR is THEN
270 wanted = 1 - wanted
280 PRINT page;
290 page = page + 1
300 END IF
310 END REPEAT rd_file
```

escape sequence "27 5" to exit italics mode.

Based on those assumptions, the program at figure one will produce a file containing alternate pages which is ready to be copied to the printer. If that is not the case you should be able to modify the program appropriately.

The program will not detect the end of the Quill file, so it crashes to a halt. Fortunately all the work has been done by then — a heavy landing rather than a crash — but you must close the two files to complete the process.

## Six-volt output

*Ronam Sweeney writes from Co. Down to ask: "Can I control electric motors by switching the six-volt output of the serial ports under keyboard control?"*

Pin 11 of each serial port has a +12V output which is intended to provide additional control signals if required by a peripheral. The voltage is not switchable, so it cannot control motors. Nor can you use the CTL1 or CTL2 ports as they are for input only.

The QControl board from Care Electronics provides TTL-level outputs from the QL together with software to drive it. Even equipped with that add-on you will still need to use your soldering iron. A TTL-level output is only about 3.4V and would not have the power to drive your motors. Instead you might use the TTL output to energise a

Figure 2.

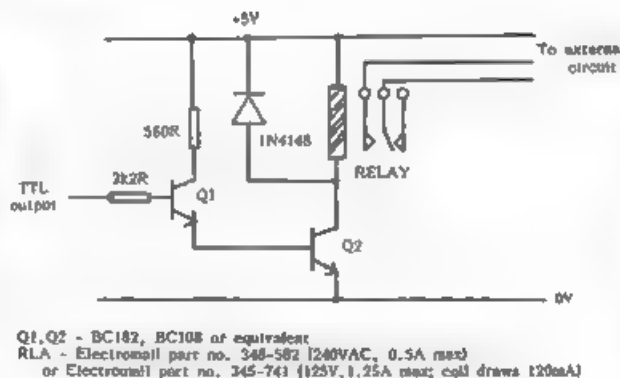
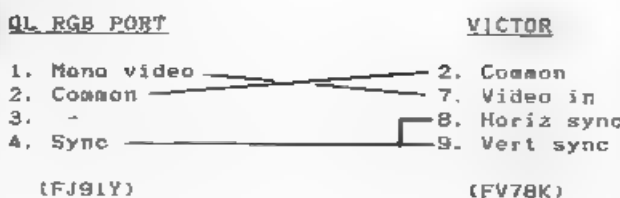


Figure 3.



relay in the motor circuit. That has the added advantage of isolating the computer from the motor. Figure two shows how you might connect a TTL output to switch a small relay in this way.

## MS-DOS?

*J. Bell is a QL/Spectrum user who says: "I have a large Masterfile database running on a Spectrum and cannot afford the time to transfer it manually to the QL. I understand that Masterfile is available for a PC running under MS-DOS. Is there an MS-DOS emulator for the QL?"*

To the best of my knowledge nobody is working on the production of an IBM or MS-DOS emulator for the QL.

There is talk of a MS-DOS emulator being available, but nobody is making

promises yet. As an alternative and available solution there is an article in the December, 1985 issue of *QL World*, then *QL User*, showing how to transfer a Masterfile database on to the QL for use with Archive. The article explains the hardware link and also contains listings of the software for both machines.

## Light a pipe

*From Swindon, D. Celano writes saying: "I can create independent jobs on my QL but to use multi-tasking to its full I need to set up a communication link between them. I can find little information on 'pipes.' Could you give me some idea how to achieve this?"*

Without resorting to writing your own device driver, a simpler solution is to

write software routines to enable one job to deposit data for the use of another. A buffer area must be set up in memory to hold the data and the sending job must know if and where there is room in the buffer. Likewise, the receiving job must know if the buffer contains data and from where to take the next data item.

The buffer can be set up using a Qdos TRAP #1 call to create it as a job with a full header including a name — see figure four. Other jobs can then use the "get job information" Trap # call to

search the jobs tree for the ID and base address of the buffer; all this could be done more easily using an absolute memory address for the buffer but that goes against the Qdos principle.

The transfer of data can then be achieved using pointers held at the start of the buffer area. The first pointer is to the next available data item and the second pointer is to the next vacant space in the buffer. The pointers must be advanced cyclically, i.e., when the pointer reaches the end of BUFAREA it must be re-set to the start.

Figure 4.

DATA TRANSFER BUFFER AREA			
	RTS		
	DC.L	#	
	DC.W	\$A4FB	
	DC.W	\$	
	DC.B	'BUFFER'	
i			
TOPPTR	DC.W	0	
BOTPTR	DC.W	0	
BUFAREA	DS.W	64	

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## 1. POINTER'S TOOLKIT

Pointer's Toolkit is intended to be a complementary toolkit for QJUMP's Super Toolkit II and/or QRAM or for Sandy's SuperQBoard with mouse. Naturally you can use it also without any of this hard software. It contains a background string-exchange command, for example, a command to kill all currently running jobs, a function which works like INPUT, but you may give a pre-defined text to edit (like the input used by PSION), a new RESPR which never returns not complete, even if there are jobs running, a monitor-save-job, and, if you have a command called POINTER or a file called PTR-IMI or PTR-KSD (from QRAM), there are commands which give you access to the pointer and real pull-down-windows from SuperBASIC!

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Writer's Toolkit gives you new fonts (no normal QL Fonts), which you can use to write anywhere to the screen (with the new command WRITE). The new fonts include Old English, Antiqua, Helvetica, (and more) in different sizes. Fonts with a height of 8, 12, 16, 20, 24, 32 etc. are also possible. Now you can forget the ugly CSIZE 3, 1 QL fonts; Writer's Toolkit gives you beautiful fonts which you can use for example to make overlays for disk-labels. All fonts are defined as proportional, so Writer's Toolkit gives you not only nice looking fonts but also a nice face.

**PRICE: 15£**

**PREIS 45,- DM**

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- \* CST SCSI - Floppy interface
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- \* and all interfaces using the QL-Standards

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**PREIS: 298,- DM**

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**PREIS 89,- DM**

Order form Floppy = 31/2" 2 x 80 Track

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Name and address

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**V**isual representation is probably the most powerful form of communication. Illustrators, conversant with more conventional materials, have yet to become aware of the vast potential of using computer graphics to provide a new and vitally important medium of expression. Equally important, computer images, although often art forms in their own right, can also serve as prototypes for artwork destined to be produced in other mediums.

Computer pictures may be originated in two main ways. The most common means of illustration development is a graphics program, of which the QL has many, each with their own features to commend them. The second method is a specially-processed image obtained with a video camera or recorder, the digitised image.

Once you have an image you wish to convert to hard copy, the majority of QL graphics programs, almost without exception, include a means to reproduce images with a dot matrix printer. If your requirements are limited to printing graphic images only, you have the option of using any of the many good commercial screen dump programs available. A full-screen, giving you two dumps per page program, is provided free with Abacus.

One of the major problems confronting users wishing to print graphic images is that dot matrix printers require particular codes to switch them from character to graphics mode. Once in graphics mode, printers require graphic data in particular formats. With an Epson-compatible printer you can use most of the printer driver programs with your printer. If not, there are a number of alternative driver programs.

The PQQL GraFix is a programmable printer driver in terms of control codes and reproduction scale. By adjusting either the horizontal or vertical scale component, you can also avoid elliptical circles. A range of printer control code sets is supplied with GraFix but if your printer is not included you can easily build your own driver.

Another particularly good driver is provided by QJump with its QRAM system and is used in its multi-tasking environment. In addition to a wide range of monochrome and colour printer driver options, you also select up to three ranges of image magnification.

### Trump Card

If you are using the Miracle RAM expansion/disc interface, Trump Card, you can use the QRAM printer driver, one of its many on-board utilities, providing you with the same facilities.

If you also wish to modify a screen image, such as reducing its finished size or position on a page, you may care to

consider using the Zitasoft programmable printer control program *Sidewinder*. It allows you accurately to select areas for standard screens so that your printed copy can occupy as little as 6mm. x 10mm., to almost full A4. Illustrations can also be rotated through 90 degrees for sideways printing.

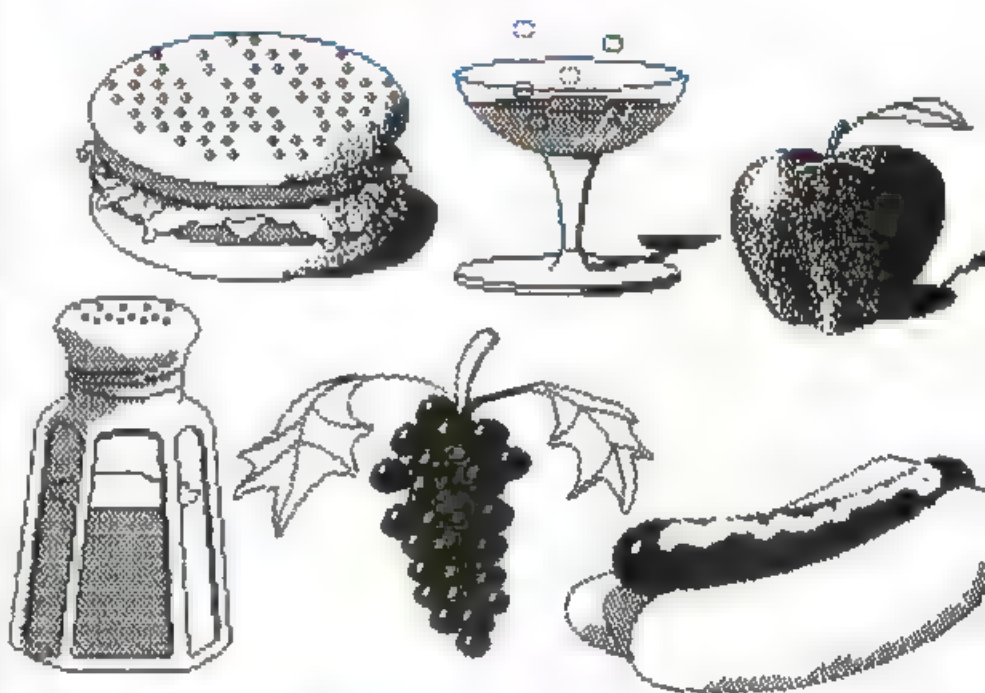
Digitisers, audio or video, are units which convert analogue signals into digital signals, the only form of data which any computer can utilise. At the

units of pixels consistent with computer resolution. In the case of the QL this means 131,072 pixels per screen in high-resolution mode.

### Near miss

The QL missed by only a narrow margin being provided with two video digitisers. The first was intended to be marketed by the French software house

# Picture



# capture

heart of all types of digitiser is a chip called an ADC. Although all ADCs perform the same job, the type of ADC used depends largely on the speed at which it has to perform.

ADCs intended for video applications are required to convert data at the rate of about once every 200ns — five million per second. Once in digital form the data stream can be processed in any number of ways.

To store a digitised video image a screen must be broken into notional

Pyramide. Its prototype digitiser consisted of a single printed circuit card and plugged into the QL expansion port.

The only image digitiser available for the QL is marketed by its Italian maker SPEM. The main limitation of it is that, because the video output is a digital signal, it must be used with a TTL monitor.

Interfacing with the QL at three points, installing the SPEM is simple. After switching off all power to your QL, push the small case connected to the digitiser

by a ribbon cable, similar to a ROM cartridge, into the QL ROM slot. Remove the QL monitor plug and re-install it in the socket on the back of the digitiser.

Connect the remaining digitiser lead, terminated in a DIN plug, to the QL monitor socket and switch the power back on to QL and monitor. The final connection is made via the co-axial socket on the digitiser to the camera or recorder.

Because of hardware limitations,

tinuous tones of a normal subject are separated into two or more distinct tones.

In MODE 8, 524,288, screen tones are possible with the QL 256 x 256 resolution. A normal colour television image contains about 50 times more tones than can be obtained with the QL and a photograph is about 1,000 times greater.

Until now the only means by which a computer image could be modified was with a graphics program but, because of

tively "brushed" over or, by selecting the CUT TO FILE option, save selected areas of a screen for your own clip art collection.

If you are using the SPEM digitiser you can use Image Processor as a controller program to grab particular frames and modify them subsequently.

The EDGE DETECTION option enables you to convert photographic-type images into a close approximation of a line drawing. This option works by drawing a line or point at the boundaries of two colours. Solid colour changes are converted to black, boundary locations are changed to white; discs are converted to circles.

By selecting the ENHANCE option you can reduce the stippled appearance some digitised pictures exhibit or, where MODE 8 pictures are displayed in MODE 4, the stippled patterns arise from the mode change. The final effect is a smoothing appearance in the picture which, obviously, depends on the overall content of the picture.

There are two sources of QL library pictures consisting of single or composite images which can be incorporated into artwork development, the Sector Software *Clip Art* and TK Computerware *Paste Art*.


Paste Art is a large library of screen images which you can edit to include only the part of a screen required either in a graphics program or in any of the QL desk-top publishers.

## Diversity

Applications for computerised images are more diversified than one might normally expect. One of the most common uses for computerised images is with a dot matrix printout as an end product. Pictures may be used as stand-alone images or can be incorporated into one or more blocks of text by any of several methods.

Another use for computer images is incorporating them as part of a visual display, such as is used for point of sale advertising or shop window effects. One application of which potential users are becoming more conscious is that computerised images can be incorporated as part of a visual design, such as is often used in a prototype advertising layout.

Desk-top publishers generally produce graphics files. As such, they often have the disadvantage of producing fonts exhibiting staircase edges on angled portions of letters. Although solely a word processor at the moment, *Text87* planned enhancements in the form of add-on modules will enable you to use *Text87* fonts and incorporate illustrations as well within blocks of text.

One method of adding images to blocks of letter quality text is the  **A**.

Computerised images, captured by a digitiser or locked safely in a proprietary clip art file, put the power of



design and illustration into the hands of non-artists. Ron Massey looks at recent additions to the QL palette.

users expecting a digitised image to exhibit photographic quality on the QL may be disappointed. Colour in MODE 8 is used to represent an eight-tone grey scale. Images are viewed in false colours with the tones ranging from, in descending order of brightness, white, yellow, cyan, green, magenta, red, blue and black.

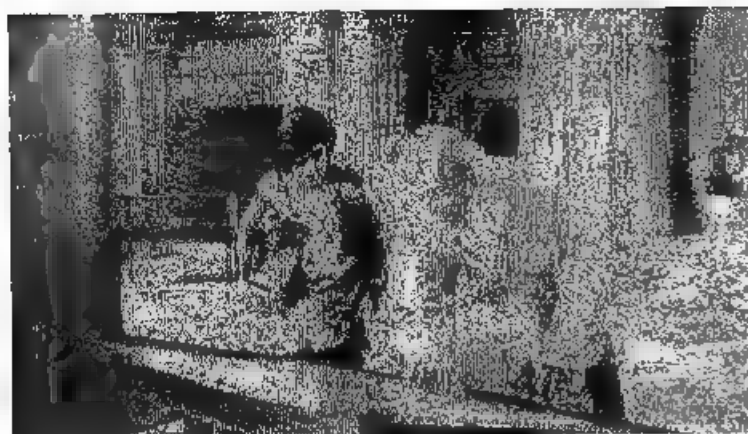
The type of picture reproduced from a digitised image with a dot matrix printer is similar to a photographic technique called posterisation, where the con-

tinuous popularity of using digitised images, Sector Software has released a new specialised product, the *Image Processor*, which includes features for modifying images produced by almost any means.

## Part save

Standard 32K screen files may be loaded into *Image Processor*, converted from MODE 8 to MODE 4 formats, recoloured, de-coloured, inverted, selec-

Clip art by T.K. Computerware and Sector Software



Stage  
one  
image  
from  
Sector  
Soft-  
ware

Burridge Cue Print system. It has the single disadvantage of being restricted to the Taxan-Kaga/Canon PW1080A range of dot matrix printers.

Although the Ultrasoft QKick is intended as a front-end interface for computer users, I find it is very useful for interrupting programs when I wish to save a screen. A typical sequence of operations involves using QKick to produce a standard screen file, one of the QL graphics packages such as the Digital Precision Eye-Q, Talent Plus QL Paint or Pyramide QL Peintre to modify the picture, and the QRAM screen dump to print it.

If you use a considerable number of pictures, storing them can become a problem. One of the techniques I often

use is to archive my screen pictures on one disc and, using QRAM, use the print option to save the images on another disc.

## High quality

By incorporating images produced in a variety of ways with any of the many aids available, even allowing for hardware limitations it is possible to produce visual products rivaling the most expensive machines. Without exception, all the products reviewed for this report are of excellent quality and represent good value.

Image libraries have been available for use with programs such as Fleet

Street Editor for some time. If you are interested mainly in producing printed copy, such libraries have much to commend them. If you cannot justify the expense of buying a video digitiser, you can take advantage of the Sector Software digitising service. If you send Sector your original illustration it will convert it to a digitised image. Returned on either Microdrive or disc, the images are standard 32K screen files, like the ones produced with the majority of QL graphics programs.

One of the areas which may eventually be considered by clip art suppliers is screens of specialised symbols such as those used in a wide range of professional and hobbyist pursuits. A question I often hear potential users ask is, besides traditional text applications such as word processing and database manipulation, what use is the computer for graphics when a photograph is usually of considerably better quality?

The computer can replicate and manipulate images more cheaply than is otherwise possible and in ways neither readily adaptable nor economically feasible with conventional photographic processes.

When illustrations are to be combined with blocks of text, whether as finished products or as an aid for design layout, the computer has no equal and the QL is particularly well-endowed with tools to produce high-quality work.

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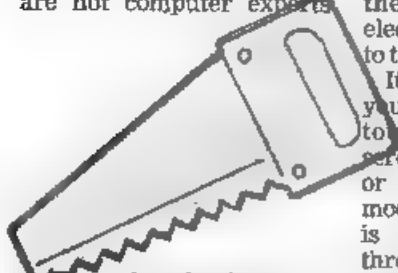
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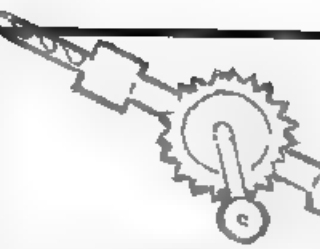
**I**f you feel you know little of the workings of the QL hardware, here is some advice on very basic matters for the people who are not computer experts.



and have bought their QLs recently. There are various common faults which cannot be dealt with unless you open the QL casing. Typical faults are repetition of characters on the screen

external cables before working on the QL. Be careful not to touch the integrated circuits inside; there is a danger of permanent damage through the transfer of static electrical charges from you to the computer.

It is desirable to earth yourself to the computer by touching the securing screw for the 5V regulator or the case of the TV modulator; the 5V regulator is the small object with three leads coming up from it, on the black, finned piece of metal heatsink to the rear of the Microdrives, and the modulator is the silver object the size of a small matchbox alongside the heatsink. Turn the QL



bottom; the ribbon cables are from the keyboard membrane and the single wires are from the three indicator light emitting diodes. Take care not to disturb the interconnections more than is necessary.

### Connections

Generally it is not necessary to separate the top casing from the bottom completely and the interconnections can be left in

levered up with a screwdriver, to release the spring pressure on the wire ends. If you forget to make a note of where the wires fit into the connector, see page 39 of the February issue.

Why do you need to look inside? A common complaint is repetition of characters on the screen i.e., you type <e> and <eee> appears. The usual reason is a faulty keyboard membrane, cost about £5. Check first that it is not dirt causing the trouble. The keyboard keycaps can be prised off with the aid of long fingernails or a thin screwdriver blade. Remove all the caps, taking care to note their positions on paper to aid refitting.

Clean the top casing underneath the caps. Use silicone spray, not any old oil, to lubricate the shafts of each key mechanism lightly. Avoid spraying the tops of the shafts where the key-caps fit, as doing so makes it easier for the caps to fall off during use.

### Membrane

It is possible that a sticking shaft will cause character repeats but more likely the membrane is at fault and that can be replaced only when the top casing has been lifted. Pull out the two ribbon cables from the connectors on the main PCB, then remove the six short screws securing the aluminium backing plate.

Before removing the membrane, look at how it, the bubble mat under it and the backing plate are located; note that the small projections and the two locating lugs at the end fit through mat, membrane and plate. If you do not put it back together correctly



place. One job for which separation is desirable is the drilling of ventilation holes above the heatsink, at the right end of the top casing — see Secrets of the Inner World, page 39, QL World, February, 1988. The two ribbon cables can be pulled out of the connectors on the main circuit board but the six wires can be pulled out only after the outer part of the connector into which they fit has been



you may have no characters on the screen at all.

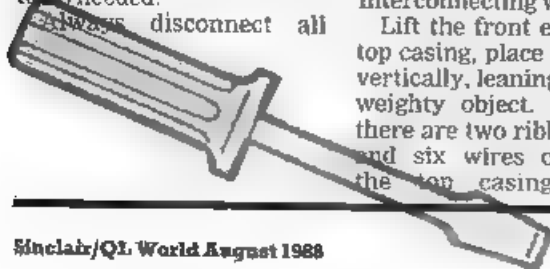
although keys are pressed once only, failure of Microdrives to load/run programs, a blank screen display when switched on i.e., no start-up messages.

Provided you are of average handiness there is no reason not to attempt rectification of faults such as these. A soldering iron is not required; a slotted screwdriver and a Philips screwdriver are the only tools needed.

disconnect all

upside down, remove the four short screws along the front edge and the four long screws along the rear edge. Do not remove the two long screws towards the front edge of the base. Hold top and bottom of the casing together and turn over the QL. Place a weighty object behind the rear edge to support the top casing when it is lifted to avoid strain being placed upon interconnecting wires.

Lift the front edge of the top casing, place the casing vertically, leaning against a weighty object. Note that there are two ribbon cables and six wires connecting the top casing to the



# Just for starters

The membrane is held to the backing plate by a piece of self-adhesive tape and this should be re-attached or replaced when a new membrane is fitted; it is best to keep the ribbon cables in position, as there is not much space for them once the casing is closed.

Perhaps the most delicate point of the membrane is where it is bent to go round the backing plate and it is possible for it to split there after a few repair jobs have been done or attempted. When that happens you can get some or all keys producing no characters on the screen but this can also happen if the ends of the cables are not in their sockets properly — see February issue.

One more point which could catch you — each ribbon cable has a protective backing and you should make sure that the ends of the backing are not

inserted into the sockets by mistake, either with or without the cables. This is another point to check if few or no keys register on the screen after a repair.

The membrane consists of two sheets with circuit tracks on each, separated by a narrow air gap; when a key is pressed it pushes the top layer and causes a track on it to make electrical contact with the corresponding track on the bottom layer. Each key actuates a simple switch. It is those switches which eventually start giving trouble, by failing to operate or not breaking cleanly and thus allowing the processor to think the key has been pressed more than once, or has been held down.

The bubble mat is a rubber spring which pushes each key back up

after the finger pressure is taken from it. It is unlikely the mat will need replacement but it may need cleaning; it is rather tacky, so do not use fluffy cloth to clean it.

While the keyboard is apart, take the opportunity to spray silicone oil lightly round the shaft area of each key; the feel of the keyboard can be improved greatly by a little lubrication. Silicone oil seems to evaporate and does not leave an oily mess; I have used it on several QLs for three or four years and have noticed no harmful effects from it but you should obviously keep it away from the electrical and mechanical parts.

When refitting the six screws to the backplate, leave the three holes at the rear edge clear, as the long rear casing screws have to go through them. Anyone having an internal memory expansion should check that none of the screws is interfering with components on the expansion PCB; one screw pressed neatly on the middle of the 68008 main processor integrated circuit, the heart of the QL, after I had had an MP memory expansion fitted and I had to file the head of the screw flat to give some clearance. Integrated circuits are fairly robust but a good bang on the middle of the keyboard might have caused this chip to cry enough and they cost £20 or more to replace.

### All change

The QL seems to respond well to the change - anything - removable approach to servicing. There are not many components which can be removed easily, so that limits the extent of your involvement if you are not knowledgeable in electronics. In practice, the only chip which might be expected to require replacement seems to be the large one at the left of the main PCB, second from the expansion connector where interfaces are plugged in. It is identified as a ZX8301 or CLA2310. If

nothing appears on the screen, or there is a uniform colour there when you switch on and you are certain the display is satisfactory, it is probable that the 8301 is faulty. The 8301 is fairly sensitive to what is connected to the QL and to

how the various units are switched on and off; it can be blown by electrical surges entering the QL from other system units, such as the display or printer.

That is a good reason for following the supplier's advice on the switching sequence; usually you will be advised to switch on the high-current devices — printer, display, disc drives — before the QL but to switch off the QL before them. That allows any transient currents/voltages to settle when the QL cannot be affected by them.

Notwithstanding that advice, it is certainly much more convenient to have all devices connected to one multiple-outlet extension socket and I have found no harm resulting from switching all units on and off together. The main point is not to switch the high-current devices on or off while the QL is already on. The 8301 costs about £10.

The next removable component to check if the 8301 seems to be satisfactory is the ZX8302, also about £10, which is to the rear of the ribbon cable sockets. That is not to say nothing else goes wrong but I have heard little reference to failure to other components, except occasionally

the central processor, the 68008 chip at the left end of the main PCB.

Systems of possible trouble with the 8302 are keyboard lock-up, print failure, complete lock-up or crashing of the computer. It is worthwhile removing any interface fitted and checking the basic QL to see if a fault is being induced/introduced by an interface. As stated many times previously, lock-ups of the computer, not the keyboard alone, can be associated with the extra current demand of an interface from the external power supply and, the longer the system is switched on, the more likely lock-ups are to occur because of overheating of the 5V regulator on the heatsink.

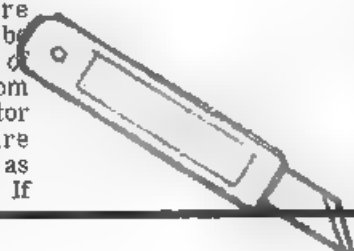
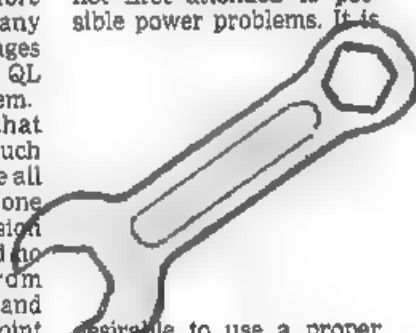
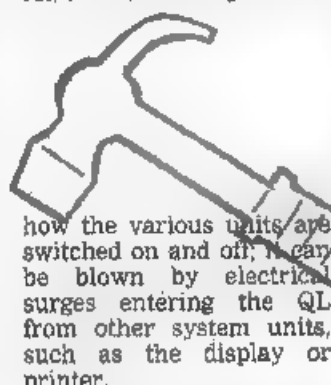
### Power first

There is no point in changing chips to try to cure lock-ups if you have not first attended to possible power problems. It is

desirable to use a proper chip extractor when removing chips but it is doubtful if many users have this tool and chips can be removed by careful levering underneath them with a thin, broad screwdriver blade.

Insert the blade between the base of the chip and the socket and rotate the handle gently from side to side to ease the pins on each side away from the socket; do the same at the other end of the chip if it is accessible. Bearing in mind the earlier comment about the dangers of static electricity when dealing with chips, try to insulate yourself from the chips being removed/fitted by wearing rubber or plastic gloves.

Check that all the pins of



a chip are straight before trying to fit it; use a small pair of long-nosed pliers to straighten any bent pins. You will often find that the spacing between the lines of pins appears to be slightly greater than between the socket rows, in which case insert one line a little way first, then push the chip towards that line to enable

There may be new problems apparent after a chip has been replaced. The cursor can blink at a frenetic rate. Do not think this means that Quill will be a pleasure to use, because a fast cursor does not go hand-in-hand with improved processing speed. One QL I had which developed this quirk after a chip change was appreciably slower than a normal one at running a memory speed check program, and one in the Turbo compiler

unless you are a programmer and want to use some of the features which were implemented only in JM or JS ROMs.

Even then, be certain that you do not lose something else in the change; the JS is not better in all respects than the JM and programs developed on one do not always work on the other. Convention in designing PCBs is for all the chips to point in the same direction; fortunately, the QL follows this convention and the dimple at one end of each chip is located towards the rear side of the computer. Watch for this as removable chips can be refitted incorrectly.

Occasional lock-ups on a system which does not normally suffer from problems caused by the mains supply can be caused by bad contact between a plug-in ROM cartridge and its socket. Weird behaviour of an Ice front-end may mean the cartridge is not pushed in fully. Such cartridges are really rather too heavy for the socket in the QL and it is not a bad idea to fit a bracing strap round the narrow edges of the cartridge and attach it to the QL with two screws.

### Spring

The Samsung JS machine is rather better in that it has a spring inside the casing to bear on the cartridge and restrict its freedom to move; it also has a spring on the expansion port — the big one at the left — but there is usually no problem with interfaces making good contact. One problem which can occur is bent pins in the internal connector, caused by forcing in an interface when it is not properly aligned with the connector. Take care when inserting

interfaces and do not make a habit of removing and refitting them.

Microdrives were mentioned in the earlier article and I will not recover the old ground, except to advise that the earlier type of connection used on most QLs I have seen between Microdrive ribbon cable and main PCB is a simple push-in arrangement, rather like that for the keyboard cables but much more difficult to remove and refit. Unless you have the later type, where there is a normal male and female connector arrangement, I would suggest sending the QL for repair if a Microdrive has to be replaced. A Microdrive unit complete to fit yourself costs £20 or more. Do not miss off the insulating washers from the securing screws if the main PCB is removed.

As a final procedure, after any repair run the Sinclair System Test 2, which is available on a cartridge, with instructions, from various QL

suppliers. This program checks Microdrives, keyboard, display, loud-speaker, serial ports and various computing functions. Test routines for the computing functions have been written but are not readily obtainable for most users. The memory access test referred to is listed as a SuperBasic program in the manual for the Turbo compiler; the Quanta library contains benchmark programs which cost little but you have to be a member of Quanta £14 pa. Such programs are by no means essential for testing a QL but they allow it to be checked to see that the performance is up to scratch and the benchmarks have a certain curiosity value if you want to compare your QL to some other computer.

### Information

#### QL connectors, leads:

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Tel: 07683 52560

#### General — connectors, cable:

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#### All QL spares:

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#### ROM chips, membrane:

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Stanford  
Nr Ashford  
Kent TN25 6DF  
Tel: 030381 2801

#### Sector Software

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Ulmes Walton  
Leyland  
Lancs PR5 3NA  
Tel: 0772 454328

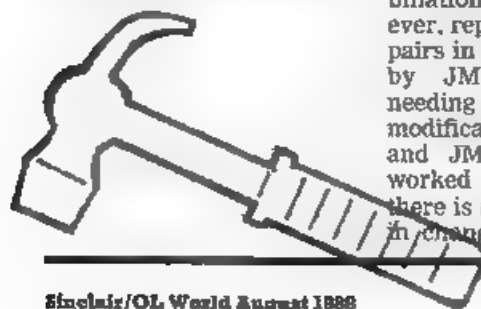
manual is a useful reference for checking the memory access speed.

### Mismatch

It may be wise to specify 8301 or CLA2310 when ordering a replacement for this chip, as the two versions can behave somewhat differently. I have found it necessary occasionally to swap chips between QLs to get compatible sets. When removing/replacing ROM chips the two medium-sized ones by the CTRL 1 and 2 ports — note that the one nearest to CTRL 1 is marked somewhere 23128, whereas the one nearest to CTRL 2 is marked 23256. There should also be another designation difference, such as QL-AH 8000 on the CTRL 1 chip and QL-AH 0000 on the CTRL 2.

Be prepared for strange behaviour if you use different-version ROM chips together; one AH and one JM chip are not likely to work well together, nor is any other of the numerous possible combinations. You can, however, replace the ROM chip pairs in later AH machines by JM pairs, without needing to make any other modifications. As later AH, and JM or JS, QLs all worked reasonably well, there is no great advantage in changing to a later set

the other line to be inserted; the sockets are slightly springy, as are the pins, and there is usually no need to bend all the pins to make them fit.







# SUPER BASIC

Mike Lloyd sizes up different types of sorting routines in search of efficiency.

A large percentage of programs are devoted to the storage and manipulation of data; and the most common type of data manipulation is the sorting routine. It is scarcely surprising, therefore, that a great deal of research has been devoted to the problems of ordering large amounts of information efficiently. Sadly, the results of those efforts seem rarely to be put into practice.

The quickest way to sort data is not to sort it at all. This seeming contradiction will be fully-explained in next month's SuperBasic but for now let us concentrate on the principle that the least possible manoeuvring of items of data will tend to lead to the fastest possible sorting times.

Most programmers begin sorting data using the bubble sort, a simple but lengthy process which involves the comparison of every item in the data list with every other item. With small amounts of information the bubble sort appears to be reasonably fast but for large datasets it is hopelessly inadequate, because the sorting time increases exponentially as the number of data items increases.

Sorting an array of 20 items, a bubble sort will make 400 —  $20^2$  — comparisons of pairs of items. Adding an extra item to the list results in 41 more comparisons, a 10 percent increase in sorting time. Doubling the list to 40 items means a total of 1,600 comparisons which must be made to complete the sorting process. If 20 items were sorted in 10 seconds, a sort of 40 items would therefore take 40 seconds to complete.

## Heap sorts

Sorting routines have been developed which cope more efficiently with very large sets of data. Heap sorts, merge sorts and quicksorts have a time-taken/array-

size relationship of  $n \log n$ , where  $n$  is the number of elements to be sorted. Twenty items involve 98 comparisons, while 40 items take just 266 comparisons to be sorted. These routines are more complex to program and are little faster than the bubble sort when handling small amounts of data.

The time taken to complete a sorting operation depends on a number of other factors apart from the number of comparisons made during the sorting process. A sorting process might recognise quickly that it is working on a partially-sorted list and therefore make fewer comparisons and so finish sooner. This situation might occur if a new item is added to the end of an already sorted list of data, or if a single value in an array is altered. An insert sort would detect quickly that only one item needed to be moved and would act accordingly. A bubble sort, on the other hand, would check laboriously through every possible combination of pairs of data to see if they needed to be exchanged.

The size of each of the data ele-

100 DEFINE PROCEDURE INSERT (items, array%)  
104 LOCAL x,y,loop,mid,hi,lo  
108 IF array% (DIMN(array%)) > ""  
112 PRINT #0; "\*\*\* Array Full!"; STOP  
116 END IF  
120 IF array%(1) = "": array%(1) = items: RETURN  
124 lo = 1  
128 FOR hi = DIMN(array%) TO 2 STEP -1  
132 IF array%(hi-1) > "": EXIT hi  
136 END FOR hi  
140 REPEAT loop  
144 mid = lo + INT((hi-lo)/2)  
148 IF hi-lo < 2  
152 mid = mid + (items > array%(mid))  
156 EXIT loop  
160 END IF  
164 IF items > array%(mid)  
168 lo = mid: ELSE: hi = mid  
172 END IF  
176 END REPEAT loop  
180 FOR y = DIMN(array%) TO mid+1 STEP -1  
184 array%(y) = array%(y-1)  
188 END FOR y  
192 array%(mid) = items  
196 END DEFINE INSERT

ments also affects sorting time. The elements of an integer array are each two bytes long, while those of numeric arrays are six bytes long. Character array elements might be several scores of bytes in length, depending on what information is held in them. The larger the element the longer it will take to transfer it in memory from one position to another. This factor tends to become significant only if character array elements exceed 100 bytes but nevertheless it is a further encouragement to reduce the amount of shifting around which goes on in a sorting process.

## QL quirk

While by rights an integer array should be sorted faster than an identical numeric array, the quirky QL operating system ensures that it is the other way around. This is because time is taken to translate integer values into floating point format before they are compared to each other. There is therefore no advantage in using integer arrays, other than to save memory space,

unless the program is to be compiled. Compilers correct this unusual Qdos feature and take full advantage of the simplicity of integer mathematics.

Whatever the sorting routine employed, there is usually an unwelcome halt in proceedings when it operates on the data which has been collected. One way of giving the appearance of a very fast sorting process is to use an insert sort to place each item into its correct position in the array as it is typed-in at the keyboard. Instead of a single, lengthy procedure, the sorting process is split into several brief bursts of activity which would probably be over too quickly for the program user to detect them.

Listing 1 uses the insert sort principle in exactly this way to sort any character array. The parameters passed to it are a single data item and the array into which it is to be fitted. Listing 2 is a test harness to demonstrate it at work on a 10-element array. Type-in both listings and watch the display. The data listed on to the screen represents input. Once 20 items have been "entered" by the random string generator the sorted array is displayed on the right-hand side of the screen. Note that the order is not strict ASCII but rather Sinclair string comparison conventions.

## Binary search

The insert procedure works only if the array into which a new item is to be stored is already sorted. It checks to see if the last element in the array is blank and reports that the array is full if it is not. Assuming that there is space in the array for an additional item, it then uses a binary search technique to find the correct place for the new addition.

Binary searching works in much the same way as you might look through a telephone directory. The directory is opened roughly in the middle and a decision made whether the name being sought lies in the front or back half. If it is in the front half, you ignore the rear part of the directory and look in the front half for the correct page, perhaps repeating the splitting process again before flicking through the pages to the one required. In a binary search an array is divided repeatedly into two with the "incorrect" half being discarded each time until only a single element, the correct one, remains.

When used in a sorting process, the binary search does not find an element but detects where a given element should go. The second half of the procedure moves all the items which occur after this position down by one place, thus creating room for the new piece of data. Finally, the

```
200 DEFINE PROCEDURE Test_Insert
205 WINDOW 448, 210, 32, 16: CSIZE 2, 0
210 PAPER 0: INK 4: CLS
215 DIM test$(20, 10)
220 PRINT "DATA ENTERED:", "DATA SORTED": INK 7
225 FOR x = 1 TO 20
230   a$ = FILL$(CHR$(RND(48 TO 127)), 0)
235   PRINT a$: BEEP 500, 5
240   INSERT$ a$ TO test$
245 END FOR
250 FOR x = 1 TO 20: AT x, 25: PRINT test$(x)
255 END DEFINE Test_Insert
```

```
300 DEFINE PROCEDURE i_sort (array, index)
310 LOCAL a
320 FOR x = 1 TO DIMN(array): index(x) = x
330 i_sort index, 1, DIMN(array)
340 END DEFINE sort
```

```
400 DEFINE PROCEDURE isort (index, bottom, top)
402 LOCAL loop, lo, hi, pointer, temp
404 lo = bottom: hi = top: pointer = bottom
405 REPEAT loop
410   IF lo >= hi: EXIT loop
412   IF array (index(lo)) > array (index(hi))
414     temp = index(lo)
416     index(lo) = index(hi)
418     index(hi) = temp
420   IF pointer = lo
422     pointer = hi: lo = lo + 1
424   ELSE
426     pointer = lo: hi = hi - 1
428   END IF
430 ELSE
432   pointer = lo
434   hi = hi - 1
436   ELSE
438     lo = lo + 1
440   END IF
442 END IF
444 END REPEAT loop
446 IF ABS(top - bottom) < 2 THEN RETURN
450 isort index, bottom, pointer-1
452 isort index, pointer+1, top
455 END DEFINE isort
```

new element is added and the sort is complete.

Listing two takes advantage of the unusual property of the TO keyword in that it can often be substituted for a comma without affecting the syntax of a statement adversely. The advantage in this instance is the statement such as INSERT A\$ TO NAMES is more meaningful to the programmer than the syntactically more correct INSERT A\$, NAMES.

## Ideal answer

The strategy of sorting on input is not the ideal answer to all sorting problems. In many cases a sort involves not one array but many related arrays. A club might hold a mailing list for its members in separate arrays for initials, surname, street, town and membership number. Published sorting routines traditionally tackle only the problem of sorting single arrays but, if multiple parallel arrays are involved, general-purpose procedures have to be replaced by a sorting utility designed specifically to cope with the application.

Sorting times can be expected to increase greatly because although there will be the same number of comparisons made as for sorting a

single array, when the swaps are made there are many more of them to accomplish before moving to the next comparison.

Additionally, data might be sorted in one way for one purpose and then be re-sorted for other uses. Using the club mailing list example, data normally might be kept in the alphabetical order of members' surnames. If personal visits were being arranged to members' addresses, the list would need to be re-arranged so that all people living the same area were listed together.

The conventional answer would be to sort the arrays by surname, re-sort them by town name, take a listing, and then restore the original order by sorting them again by surname. The prospect of sorting a number of related arrays only once is such a cumbersome process that it should, if possible, be avoided; to contemplate repeatedly sorting and re-sorting a large amount of data spread across several arrays is horrifying.

Remembering that the quickest way to sort a list is not to sort it all, how can tabs be kept on a list of items which are kept in an array in the random order in which they were

◀ Listing 2

◀ Listing 3

◀ Listing 4



entered originally? One way is to borrow from the technique used to find particular entries in, say, a computer manual. The keywords might be grouped in the book according to the functions they perform but they would also be listed in an index in alphabetical order.

## Quicksort

Indexing is also useful when arrays of very large character items or multiple parallel arrays are sorted, or when lists need to be sorted in a number of ways simultaneously.

Listings 3 and 4 are an adaptation of the Quicksort algorithm published in the January, 1987 edition. Before the Quicksort routine is called the numeric array being used as an index is initialised at line 320. The Quicksort algorithm identifies an

arbitrary element and puts all the values greater than this element to one side of it in the array and all the small values to the other side. Each half of the array is split recursively until every item is sorted in order. All the comparisons in listing four are made on the main array but only the values held in the indexing array are moved.

As with the insert sort, the Quicksort is complete with a test harness, at Listing 5. It dimensions two arrays, one for the data and one for the index, and fills the data array with randomly-produced data. The sort is then performed and the results printed on the screen alongside the original input. Of course, listing the

data array reveals that it remains in random order. Only when it is accessed via the index array will it be possible to determine the sorted order. Other related arrays could be accessed using the same index.

The test harnesses demonstrate how the two sorting mechanisms could be accessed from within any uncompiled SuperBasic program. The sorting routines are written to cope with string arrays only but they can be adapted readily to work with numeric arrays. Further amendment to the comparison algorithms in each sorting routine would allow data to be sorted in reverse order, or in length of string order, or according to any other criteria required.

## LISTING 5

```
500 DEFine PROCedure Test_Isort
505 WINDOW 440, 210, 32, 16: CSIZE 2, 0
510 PAPER 0: INK 7: CLS
515 DIM test$(20, 10), ptr(20)
520 FOR x = 1 TO 20
525 test$(x) = FILL$(CHR$(RND(32 TO 127)), 10)
530 END FOR x
535 PRINT "UNSORTED ARRAY" TO 20: "SORTED ARRAY"
540 AT 0, 0: INK 4: OVER -1: PRINT test$: OVER
545 i_sort test$, ptr
550 FOR x = 1 TO 20
555 AT x, 20: PRINT test$(ptr(x))
560 END FOR x
565 END DEFine Test_Isort
```

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- DUPLICATE CODE SHARING allows multiple copies of the same program without losing memory to additional code space e.g. 11 copies of Abacus with 230K free.
- COMMAND FILE MODULE easily creates files which will operate the machine in your absence. For example it could load quill, fill in your address, type a standard letter and print it. You will, however, have to post it yourself.
- USER FRIENDLY. It was described as 'virtually idiot proof' by a major software reviewer.

**Available on disc or Microdrive and still only £25**

## CAMBRIDGE COMPUTERS Z88

*-from Sir Clive Sinclair*

**£287**

- Built in screen
- Full size keyboard
- Built in word processor
- spreadsheet and database
- 32K RAM
- Diary and Calculator
- Comms software
- All Z88 accessories available
- Runs for 20 hrs on 4 AA batteries
- Many more features

**QL-Z88 file transfer software £15 (QL-Z88 cable - £8)**

**NEW!**

Use the QL for storage and editing of files, or use the Z88 as a portable terminal. Version 2 now available - send SAE for update!

**Purpose built Z88 Carrying case with room for six Eproms. Protection for your portable for only £10.**

### SOFTWARE

Turbo Quill+	£14.00
Turbo Quill	£12.00
Cartridge Doctor	£13.00
Eye Q	£29.00
Turbo	£99.00
The Editor (DP)	£30.00
Forth	£34.00
Toolkit 2 (EPROM)	£34.00
Keydefine	£10.00
Talent Workbench	£25.00
Psion Chess	£17.00
Better Basic (DP)	£25.00
Home Finance	£20.00
<b>WRITETURN</b>	<b>£12.00</b>

Prints spreadsheets, documents and text files sideways on an Epson or compatible printer, no more taping two sheets together!

### QL SPARES

**Service Manual** - This is the most up to date book for repairing the QL. It contains all circuit diagrams, faultfinding charts and oscilloscope displays to enable you to repair your own QL or understand how it works. This is not the cheap photocopy offered by some firms. **£25.00**

**QL Test Software** - Including RS232 loopback lead. Tests all major functions of the computer - sound, colour, keys, RS232, Micro-drive etc. Used by repair companies - **£14.00**

Keyboard membrane	£6.00
Bubble mat	£3.00
JS ROM set	£28.00
ZX8301 ULA	£15.00
ZX8302 ULA	£13.00

### VARIOUS

Trump Card	£175.00
QL dustcover	£5.00
Microdrive labels on tractor feed per 100	£3.50
20 Microdrives in Transform storage box	£40.00
Internal 640K memory upgrade	£80.00
Asitacom 1000 modem	£190.00

# SECTOR

## PAGE DESIGNER 2

**A comprehensive new desktop publishing program for the expanded Sinclair QL, written by Dilwyn Jones.**

Page Designer 2 is a powerful new version of the program from the Quanta software library. Completely re-written and with a host of new facilities, it puts desktop publishing within the reach of everyone, at an affordable price. Page Designer 2 incorporates many features found on systems costing thousands of pounds. It provides full WYSIWYG, is easy to use and is supplied with a comprehensive manual. The program will run on a Thor or QL with at least 256K expansion memory and disc interface. A modular version will be made available for non-disc users.

- Create documents up to 9 pages
- Memory resident hires and text fonts
- Variable linespacing and all QL text sizes
- Cut & paste to memory and file for clip art
- Transparent superimposition option
- Load in Quill docs, .lfs and ASCII text files
- Full graphics with rotate/reflect.
- Taskmaster, Spellbound & Gram compatible
- Page magnify and preview facilities

### IMAGE PROCESSOR

ONLY £19

- ★ Converts pictures from mode 4 to 1 and back again
- ★ Computerised image enhancement
- ★ Edge detection
- ★ Recolour/decolour, Invert black/white
- ★ Brush for hand alterations
- ★ Creates clip art for Page Designer
- ★ SPEM Digitiser compatible



**Loads more features, write for full specification. Only £35.**

## PD2 FONT PACK 1

**FontPack1 is the first new font package to be released for Page Designer 2.**

Featuring 'industry standard' typefaces like Times and Helvetica as well as more stylized fonts like Urban it will add that extra sparkle to your documents. Font Pack 1 also includes a complete range of fill patterns. Give your documents that original look for only

**£6.00**





# SOFTWARE

## CLIP ART COLLECTION

**7 discs packed with clip art to enhance and enliven your PD2 documents.**



Have you heard the news? your newsletters, advertisements, flyers and other Page Designer 2 documents will have 100 percent more impact when you include these clip art designs.



There are seven discs altogether:

- 1-3: Animals
- 4: Maps
- 4: Sport
- 6: Business
- 7: Cartoons



**Available now. Only £6 each**

## BULLETIN BOARD

**What QL and Z88 owners have been waiting for. An on-line magazine dedicated exclusively to these machines.**

Anyone can log on to the bulletin board, absolutely free of charge, from 80'clock in the evening until 9 O'clock the following morning, all weekends and Bank Holidays.

Anyone with a modem and 1200/75 Viewdata software (including the Miracle modem) can access the board for the news, letters, reviews, problems and to order QL and Z88 products on-line.

The board will feature noticeboards for second hand equipment advice, messages etc. and last minute Sector Software bargains that didn't make the QL World copy deadline. Special offers will also be advertised.

Modems to access the board are available, price £45 including software from Sector Software.

**Phone 0772 454328 after 6pm and at weekends**

**THE**

# PROGS

If you have a program worthy of consideration, send it 'The Progs',  
Sinclair QL World, Greencoat House, Francis Street, London SW1P 1DG.  
We pay everything published at the usual page rates.

## Program of the month

# DUAL DOMINOES

**D**ual Dominoes contains two domino games in the European style. Written in Basic on a German MGG QL, the program is played in Mode4 and loads with "dom" or "domino". No German characters have been used but my apologies if some of the words sound rather funny as my English is not perfect.

In both the games one or two people can play against Mr Pixl and Mr Chipso. The

full rules are contained in the program.

In the first game, "Between", you can use the cursor keys to choose one of your tiles and put it in one of the three rows, if it fits. If you are able to do that you can go on to set one or more tiles between the rows ■ both ends of the tile match correctly. Each in-between tile results in 10 points.

If a row is full, you can still add tiles — the whole row moves, creating new

combinations to build between.

The second game, "Five", starts like the first game with the lowest tile with matching numbers, this time starting from the top. You win points only if, after you have placed your tile, the sum of all the last numbers of the dominos off all the rows from above is divisible by five — for example 5, 10, 15, 20 and so on. A new row is built if you set a double tile unless a new row giving a new

sum into which to divide prevents you winning points you would otherwise have gained.

At the end of both games, there is a scoreboard which counts up your points and subtracts the values of the tiles you have remaining. If you play more games it counts how often you have won.

Lines 3840 to 3870, the procedure to delete and save, "s(x)", may be left, or typed into the computer first of all.

```
100 MODE 4:very=1
110 title
120 DEFine PROCedure titel
130 OPEN#3,scr_312x256a0x0
140 PAPER #3,5:CLSE#3
150 CSIZE#3,2,1:INK#3,49:AT#3,2,5:PRINT#3,'o o ■
  * D o m i n o * o o o':AT#3,6,5:PRINT#3,"o o * b
  y Heimo Giske * o o"
160 IF very:AT #3,9,8:PRINT#3,'m FIVE & BETWE
  EN o':very=0:PAUSE 100
170 INK#3,0
180 PAUSE 100
190 END DEFine
200 OPEN#4,scr_3OVER#4,1
210 OPEN #5,con_312x18a0x178
220 WINDOW #5,500,16,6,180
230 PAPER #5,7:INK#5,0
240 CLSE#5,3
250 BORDER #5,1,292:CSIZE#5,1,0
260 OPEN#7,scr_500x10a12x160
270 WINDOW#7,490,10,12,160
280 PAPER#7,5:INK#7,0
290 DIM fenA(11),compS(12,1),compL(12,1),deinA(12,
```

```
,1),deinL(12,1),dominoS(55,1),feldF(10,9),numS(9,
  1)
300 FOR i=1 TO 11:fenA(i)=10+49*(i-1)
310 hges=0:hges1=0:cgew=0:cgew1=0
320 RESTORE
330 FOR i=1 TO 55:READ dominoS(i)
340 FOR i=1 TO 10:READ feldF(i)
350 FOR i=0 TO 9:READ numS(i)
360 DEFine PROCedure init
370 INK#0,7:PAPER#0,3:CLS#0:INPUT#0,'Are 1 or 2 pe
  reons playing against QL-Messers. Pixl & Chipso? -
  1/2 ':spiel
380 IF spiel>1 THEN spiel=1:ELSE spiel=0
390 INPUT#0,'Give me your name: ':namS:IF spiel TH
  EN INPUT#0,'Give me the name of the second player:
  ':namL:n2=CODE(namS):IF n2>96 THEN namL(1)=CHR
  S(n2-32)
400 n1=CODE(namS)
410 IF n1>96 THEN namS(1)=CHR$(n1-32)
420 END DEFine init
430 CLSE#5:INPUT#5,'You want to play >BETWEEN< or >
  FIVE< ? b/r ':zoff#
440 IF zoff#=-'b' THEN zwischen:ELSE fuerf
```

```

450 DEFine PROCEDURE zwischen
460 in=1:sw=1
470 OPEN#20,scr_512x2560x3
480 OPEN#21,scr_512x2560x78
490 OPEN #22,scr_512x2560x153
500 WINDOW#20,512,25,0,3
510 WINDOW#21,512,25,0,78
520 WINDOW#22,512,25,0,153
530 FOR i=2# TO 22:INK#i,7:PAPER #i,2:CLS#i
540 titel
550 DIM voll(14),voll1(14)
560 DIM lin1(15),lin2(15),lin3(15)
570 PRINT#20,"Player: 1 - 2 persone and 2 Computer
-players - Choose stone with arrowkeys and
Enter' then put it in one of the rows with number
1 - 3."
580 PRINT#21,"If you don't have a fitting stone, t
han 'Space' (-5 pts). If the stone is added, may o
ne ore more stones be get (choic=antar) between t
he rows(+10 Pkte)."
590 PRINT#22,"If there is no fitting stone (up and
down) to be put between, then 'Space'. If a p
layer has no stones left, the game is over. (First
stone=10 pts). Have fun!"
600 IF in THEN init:in=0
610 CLS#3:PRINT#3,"Please wait! I shuffl
e und distribute!"CLS#3
620 seven=7:seven1=7:lin1=1:lin2=1:lin3=1:compsev=7:c
ompsew1=7:ende=0:ent=0:aue=0
630 domzal=29:h1=0:h2=0:c1=0:c2=0
640 IF spiel THEN domzehl=29:ELSE domzehl=22
650 shake
660 FOR i=8 TO 12:dein(1)="xx":dein1(1)="xx":com
p(1)="xx":comp1(1)="xx"
670 FOR i=1 TO 7
680 comp(1)=domino(1):comp1(1)=domino(7-i):de1
n(1)=domino(14+i):IF spiel THEN dein1(1)=domino
(21-i)
690 END FOR i
700 BEGIN:IF rty THEN GO TO 530
710 CLS#3:CLS#20:CLS#21:CLS#22:CSIZE#3,0,0
720 WINDOW #3,500,10,12,196
730 CLS#3
740 REPEAT delay
750 erf=0
760 bim 1
770 SELECT ON start
780 -1:PRINT#5,"It's ":nam(1)"'s turn!":dr=1:fens
t dein(1),seven
790 IF NOT star THEN pfeil dein(1),seven:IF weiter T
HEN wahl dein(1),seven
800 IF star THEN grund dein(1),nam(1):star=0:h1=h2=10
810 neustein dein(1),domzal,seven:h1=h2+erf
820 IF NOT seven THEN pu 3:schluss:GO TO 530
830 -2: PRINT#5,"Pixl plays!":dr=3:fenst comp(1),c
ompsew
840 IF NOT star THEN compsuch comp(1),compsew:IF we
ter THEN wahl comp(1),compsew
850 IF star THEN grund comp(1),"Pixl":star=0:c1=c2=1
0
860 neustein comp(1),domzal,compsew:c1=c2+erf
870 IF NOT compsew THEN pu 3:schluss:GO TO 530
880 -3:PRINT#5,"It's ":nam(1)"'s turn!":dr=2:fens
t dein1(1),seven1
890 IF NOT star THEN pfeil dein1(1),seven1:IF weiter
THEN wahl dein1(1),seven1
900 IF star THEN grund dein1(1),nam1(1):star=0:h1=h2=1
0
910 neustein dein1(1),domzal,seven1:h2=h2+erf
920 IF NOT seven1 THEN pu 3:schluss:GO TO 530
930 -4: PRINT#5,"Chipo plays!":dr=4:fenst comp1(1),c
ompsew1
940 IF NOT star THEN compsuch comp1(1),compsew1:IF w
eiter THEN wahl comp1(1),compsew1
950 IF star THEN grund comp1(1),"Chipo":star=0:c2=c2
+10
960 neustein comp1(1),domzal,compsew1:c2=c2+erf
970 IF NOT compsew1 THEN pu 3:schluss:GO TO 530
980 END SELECT
990 start=start+1
1000 IF start=5 THEN start =1
1010 IF NOT spiel AND start=3 THEN start=4
1020 weiter=0
1030 IF ende=5 THEN schluss:GO TO 530
1040 END REPEAT delay
1050 END DEFine
1060 DEFine PROCEDURE shake
1070 FOR i=1 TO 100
1080 P-RND(1 TO 55)
1090 G-RND(1 TO 55):IF G=I THEN GO TO 1090
1100 dritt(1)=domino(1):domino(1)=domino(55):domin
o(55)=dritt(1)
1110 END FOR i
1120 END DEFine
1130 DEFine PROCEDURE pfeil (weg$,sew)
1140 IF weiter AND dr<3 THEN fenst weg$,sew
1150 abst=(INT((sew/2)+1)*7)-1
1160 AT #3,0,abst:PRINT #3,CHR$(191)
1170 hoch=2-sew*7

```

```

1180 REPEAT suche
1190 as=INKEY$(1)
1200 IF as=CHR$(192) THEN abst=abst-7:bim 3
1210 IF as=CHR$(200) THEN abst=abst+7:bim 3
1220 IF abst<2 THEN abst=hoch
1230 IF abst>hoch THEN abst=3
1240 bal=(abst+7-3)/7
1250 IF NOT weiter THEN
1260 IF as=CHR$(10) THEN
1270 bim 4:wo weg$(2):bim 5:IF NOT gut THEN CLS#
3:erf=erf-5:pu 2:RETURN
1280 IF gut THEN ende=0:bild weg$(2),bsteinsweg
weg$,2:CLS#3:weiter=1:RETURN
1290 END IF
1300 END IF
1310 IF as=CHR$(32) THEN
1320 IF NOT weiter THEN
1330 IF ende THEN ende=ende+1
1340 erf=erf-5:pu 2
1350 END IF
1360 weiter=0:aue=1:CLS#3:RETURN
1370 END IF
1380 IF weiter AND as=CHR$(10) THEN bonus weg$(2)
,werk(1),2:IF weg THEN steinsweg weg$,2:CLS#3:RE
TURN ELSE CLS#3:RETURN
1390 CLS#3
1400 AT#3,0,abst:PRINT#3,CHR$(191)
1410 END REPEAT suche
1420 END DEFine
1430 DEFine PROCEDURE begin
1440 atep=1:rty=0
1450 FOR h=0 TO 9
1460 FOR i=1 TO seven
1470 IF dein(1)=num(1):THEN start=1:weg=1:RETURN
1480 IF comp(1)=num(1):THEN start=2:weg=1:RETURN
1490 IF dein1(1)=num(1):THEN start=3:weg=1:RETURN
1500 IF comp1(1)=num(1):THEN start=4:weg=1:RETURN
1510 END FOR i
1520 END FOR h
1530 rty=1
1540 END DEFine
1550 DEFine PROCEDURE grund (cd$,name$)
1560 PAUSE 30
1570 PRINT#5,"As foundation-stone ":ad$(weg):""
is set by ":name$:
1580 PAUSE 150:CLS#5
1590 bild cd$(weg),1:bild ad$(weg),2:bild cd$(weg)
,3
1600 lin1(1 TO 2)=cd$(weg):lin1=lin1(1):lin2(1 T
O 2)=cd$(weg):lin2=lin2(2):lin3(1 TO 2)=cd$(weg):
lin3=lin3(1)
1610 steinsweg cd$,weg
1620 pu 1:PAUSE 30
1630 END DEFine
1640 DEFine PROCEDURE wo (we$)
1650 IF dr<3 THEN
1660 gut=0
1670 CLS#5:PRINT#5,"which row? (1 - 3)"
1680 bs=INKEY$(1)
1690 IF bs<1 OR bs>3 THEN GO TO 1680
1700 b=bs-0
1710 ELSE
1720 b=bs
1730 END IF
1740 SELECT ON b
1750 -1:weg 1X:IF gut THEN lin1=weg(2)
1760 -2:weg 12X:IF gut THEN lin2=weg(2)
1770 -3:weg 13X:IF gut THEN lin3=weg(2)
1780 END SELECT
1790 DEFine PROCEDURE erg (1X)
1800 IF we(1)=1X THEN gut=1: RETURN
1810 IF we(2)=1X THEN dr=1:weg(1)=we(1):we(2)=
we(2)-dr:gut=1
1820 END DEFine
1830 END DEFine
1840 DEFine PROCEDURE steinsweg (weg$,2al)
1850 weg$(2al)="xx"
1860 FOR j=1 TO 4
1870 FOR i=1 TO 10
1880 IF weg$(i)='xx' THEN weg$(i)=weg$(i+1):weg$(i+
1)='xx'
1890 END FOR i
1900 END FOR j
1910 IF dr=1 THEN seven=seven-1
1920 IF dr=2 THEN seven1=seven1-1
1930 WINDOW#4,80,50,fen4(2al),206:PAPER#4,2:CLS#4
:PAPER#4,0:PAUSE 20
1940 IF dr=3 THEN compsev=compsev-1
1950 IF dr=4 THEN compsew1=compsew1-1
1960 END DEFine
1970 DATA '00','01','02','03','04','05','06','07',
'08','09','10','11','12','13','14','15','16','17','18',
'19','20','21','22','23','24','25','26','27','28','29','30',
'31','32','33','34','35','36','37','38','39','40','41','42',
'43','44','45','46','47','48','49','50','51','52','53','54',
'55','56','57','58','59','60','61','62','63','64',
'65','66','67','68','69',

```

```

'77','78','79','88','89','99'
1980 DATA '00000000','00001000','001000100','001
00100','101000101','101010101','10100101','1011
101','11101111','11111111'
1990 DATA '00','11','22','33','44','55','66','77',
'88','99'
2000 DEFINE PROCEDURE druck (stein)
2010 ful=0
2020 FOR j=0 TO 93 STEP 17
2030 FOR k=12 TO 42 STEP 15
2040 ful=ful+1
2050 IF stein*(ful)*1 THEN FILL $4,2:CIRCLE $4,k
,j,4:FILL$4,0
2060 END FOR k
2070 END FOR j
2080 LINE $4,5.50 TO 54.50
2090 END DEFINE
2100 DEFINE PROCEDURE fenst (deit,sev)
2110 CLS:O:INKEY$
2120 FOR i=1 TO sev
2130 IF deit*(i)<>'xx' THEN
2140 WINDOW $4,40,50,Fenst(11,205
2150 BORDER $4,2.7
2160 CLS
2170 IF deit THEN lies deit(1):druck stein:ELSE A
T$4,2.2:PRINT$4,CHR$(158)
2180 END FOR i
2190 END IF
2200 END DEFINE
2210 DEFINE PROCEDURE lies (aug)
2220 IF zw THEN ein=1:zwei=2:ELSE eins=2:zwei=1
2230 stein=feld*(aug*(ein)+1)&fld*(aug*(zwei)-1
)
2240 END DEFINE
2250 DEFINE PROCEDURE bild (werk,zal)
2260 SELECT ON zal
2270 -1:aa
2280 -2:ab
2290 -3:ac
2300 END SELECT
2310 DEFINE PROCEDURE aa
2320 IF l2>13 THEN schieb lin1$,l2,20
2330 lindruck 20,l2,werk
2340 lin1$(l2 TO l2+1)=wer$:l2=l2+2
2350 END DEFINE
2360 DEFINE PROCEDURE ab
2370 IF l2>13 THEN schieb lin2$,l2,21
2380 lindruck 21,l2,werk
2390 lin2$(l2 TO l2+1)=wer$:l2=l2+2
2400 IF h2<(l2-1) THEN hig=l2-1
2410 END DEFINE
2420 DEFINE PROCEDURE ac
2430 IF l2>13 THEN schieb lin3$,l2,22
2440 lindruck 22,l2,werk
2450 lin3$(l2 TO l2+1)=wer$:l2=l2+2
2460 END DEFINE
2470 hig=hig
2480 IF l2>13 THEN swait=l2-1:ELSE swait=l2-1
2490 IF swait<hig+1 THEN hig=swait
2500 END DEFINE
2510 DEFINE PROCEDURE neustein (werk,do,sev)
2520 IF ende THEN RETURN
2530 IF do>55 THEN ende=1:RETURN
2540 FOR i=1 TO 11
2550 IF werk*(i)='xx' THEN werk*(i)=domino*(do):GO T
O 2530
2560 END FOR i
2570 GO TO 2590
2580 do=do+1
2590 sev=sev+1
2600 IF sev>11 THEN sev=11
2610 END DEFINE
2620 DEFINE PROCEDURE schieb (lin$,l2,kan)
2630 l2=l2-2
2640 FOR i=3 TO 15
2650 lin$(i-2)=lin$(i)
2660 END FOR i
2670 PAN$kan, -73
2680 END DEFINE
2690 DEFINE PROCEDURE compuch (com$,com)
2700 FOR i=1 TO 2
2710 FOR j=1 TO com
2720 ji=j
2730 bliek*=com*(j)
2740 IF bliek*(i)=11X THEN zal=wo com*(j):bild co
m*(j),zastainwag com$,ji:ende=0:waiter=1:RETURN
2750 IF bliek*(i)=12X THEN za=2:wo com*(j):bild co
m*(j),zastainwag com$,ji:ende=0:waiter=1:RETURN
2760 IF bliek*(i)=13X THEN za=3:wo com*(j):bild co
m*(j),zastainwag com$,ji:ende=0:waiter=1:RETURN
2770 END FOR j
2780 END FOR i
2790 waiter=0
2800 PAUSE 50:CLS:PRINT$5,'I cannot set a stone!
':pu 2
2810 IF ende THEN ende=ende+1
2820 END DEFINE
2830 DEFINE PROCEDURE bonus (werk$,werk$,num)
2840 LOCAL i

```

```

2850 FOR i=1 TO 2
2860 FOR j=1 TO hig
2870 IF werk*(2)=lin1$(j) AND lin2$(j)=werk*(1) AND
voll1(j)>1 THEN voll1(j)-1:wo=28:IF de<3 THEN ausf
:RETURN:ELSE:ausf:stainwag werk$.num:END IF
2880 IF werk*(2)=lin2$(j) AND werk*(1)=lin3$(j) AND v
oll1(j)>1 THEN voll1(j)-1:wo=108:IF de<3 THEN au
sf:RETURN:ELSE:ausf:stainwag werk$.num:END IF
2890 END FOR j
2900 IF i=1 THEN drit$=werk*(1):werk*(1)=werk*(2):wer
k*(2)=drit$
2910 END FOR i
2920 weg=0:RETURN
2930 DEFINE PROCEDURE ausf
2940 WINDOW$4,36.5.50,(j-1)*36.5,wo
2950 pu 1
2960 CLS
2970 LINE$4,0.0 TO 53.0 TO 53.100 TO 0.100 TO 0.0
2980 lies werk
2990 druck stein
3000 weg=1:erf=erf+10
3010 END DEFINE
3020 END DEFINE
3030 DEFINE PROCEDURE wahl (werk$,sev)
3040 IF de<3 THEN
3050 PRINT$5,'You want to put a stone between?'
3070 gfall werk$,sev:CLS
3080 IF waiter THEN GO TO 3050:ELSE RETURN
3090 END IF
3100 IF de>2 THEN
3110 FOR i=1 TO sev
3120 num=i
3130 bonus werk*(i),werk$.num
3140 END FOR i
3150 END IF
3160 END DEFINE
3170 DEFINE PROCEDURE schluss
3180 a=0:b=0:c=0:d=0
3190 BORDER$0,2,106
3200 CLS:CLS:PRINT$5,'The game is over!'
3210 FOR i=1 TO 7
3220 IF deint*(i)<>'xx' THEN a=deint*(i):a=a+1:
a*(2)
3230 IF apiel THEN IF deint*(i)<>'xx' THEN b=dein
t*(i):b=b+1:b*(2)
3240 IF comp*(i)<>'xx' THEN c=comp*(i):c=c+1:
c*(2)
3250 IF comp1*(i)<>'xx' THEN d=comp1*(i):d=d+1:
d*(2)
3260 END FOR i
3270 h1=h1-a:h2=h2-b:c1=c1-c:c2=c2-d
3280 klick=0
3290 FOR i=540 TO -20 STEP -1
3300 IF h1=1 THEN hges=hges+1:klick=1
3310 IF h2=1 THEN hges1=hges1+1:klick=1
3320 IF c1=1 THEN cges=cges+1:klick=1
3330 IF c2=1 THEN cges1=cges1+1:klick=1
3340 IF klick THEN GO TO 3360
3350 END FOR i
3370 CLS:PRINT$5,'Result! Left stone
s are subtracted!'
3380 PRINT$0, 'h1' has got 'h1:' points ('h1:
' - 'a:')':AT$0,0.48:PRINT$0,'h2' has got 'c1:
' points ('c1:' - 'a:')'
3390 IF apiel THEN AT$0,2.0:PRINT$0, 'h1' has go
t 'h2:' points ('h2:' - 'b:')':AT$0,3.5:PRINT
$0,hges1,' times won altogether!'
3400 AT$0,2.48:PRINT$0,'h2' has got 'c2:' poin
ts ('c2:' - 'b:')'
3410 AT$0,1.5:PRINT$0,hges,' times won altogether!
':AT$0,1.55:PRINT$0,cges,' times won altogether!'
3420 AT$0,3.55:PRINT$0,cges1,' times won altogethe
r!'
3430 BORDER$0,0
3440 PAUSE 250:CLS:PRINT$5,' Press any
key for new game '
3450 PAUSE
3460 END DEFINE
3470 DEFINE PROCEDURE lindruck (kan, l2,werk)
3480 LOCAL wagi:LOCAL zal
3490 lies werk
3500 zal=0
3510 wagi=INT(l2/2)*223
3520 IF wagi>1561 THEN wagi=1561:
3530 INKEY$kan,0:FILL$kan,1
3540 LINE $kan,wagi,0 TO wagi,100 TO wagi+223,100 TO
wagi+223,0 TO wagi,0
3550 INKEY$kan,7:FILL$kan,0
3560 LINE $kan,wagi,0 TO wagi,100 TO wagi+223,100 TO
wagi+223,0 TO wagi,0
3570 LINE$kan,wagi+112.8 TO wagi+112.95
3580 FOR i=15:wagi TO 200:wagi STEP 185/5
3590 FOR j=15 TO 85 STEP 35
3600 zal=zal+1
3610 IF stein*(zal) THEN FILL$kan, 1:CIRCLE $kan,
i,j,8:FILL $kan,0
3620 END FOR j
3630 END FOR i
3640 END DEFINE

```



```

3650 DEFine PROCedure pu (zal)
3660 SELECT ON zal
3670 =1:ATE5,0,40:PRINT5,'
3680 =2:ATE5,0,40:PRINT5,'makes 10 points!':bim 2:P
AUSE 50
3690 =3:ATE5,0,40:PRINT5,'makes minus 5 points!':
bim 6
3700 =3:ATE5,0,30:PRINT5,'No stones left! End of
the game!':bim 7:PAUSE 50
3710 END SELECT
3720 DEFine PROCedure bim(v)
3730 SELECT ON v
3740 =1:BEEP 10000,50,8,1500,14,16,7,0
3750 =2:BEEP 30000,-1,5,850,1,9,0,0
3760 =3:BEEP 2500,13,0,75,7,9,0,0
3770 =4:BEEP 2000,40
3780 =5:BEEP 2000,20
3790 =6:BEEP 0,52,-2,75,3,5,7,0:PAUSE 50:BEEP
3800 =7:FOR 1=40 TO 2 STEP -9:BEEP 0,1:PAUSE 10
3810 BEEP
3820 END SELECT
3830 END DEFine
3840 DEFine PROCedure s (ff)
3850 DELETE 'mdv'affa'._dom':SAVE 'mdv'affa'._dom'
3860 END DEFine s
3870 DEFine PROCedure fuenf
3880 in=1:zw=0:hilf
3890 IF in THEN init:in=0
3900 OPEN#50,sor_
3910 PAPER#50,5
3920 titl:=sheke
3930 DIM reihe$(44,1)
3940 FOR i=1 TO 40:reihe$(i)='xx'
3950 DIM counter(12)
3960 reihe$=3:reihe$='09':ende=0:echt=1
3970 seven=5:seven1=5:compsev=5:compsev1=5
3980 h1=0:h2=0:c1=0:c2=0
3990 FOR i=6 TO 12:dein$(i)='xx':(dein$(i))='xx':co
mp$(i)='xx':comp$(i)='xx'
4000 FOR i=8 TO 5
4010 comp$(i)=domino$(i):comp$(i)=domino$(5+i):da
in$(i)=domino$(10+i):IF spiel THEN dein$(i)=domin
o$(15+i)
4020 domzahl=21
4030 END FOR i
4040 begin
4050 IF rtry THEN GO TO 3920
4060 CLS#3:CLS#5:CLS#23,0,0
4070 WINDOW #3,500,40,12,195
4080 REPEAT lily
4090 gut=0:CLS#3:aus=0
4100 SELECT ON start
4110 =1:PRINT5,'It's "name": "turn!":dr=1:bim
1:fenet dein$,seven
4120 arrow dein$,seven,name$:IF gut THEN count h1,
name$
4130 IF aus THEN neustein dein$,domzahl,seven:ELSE
IF seven<5 :aus=1:GO TO 4130
4140 IF NOT seven THEN pu 3:schluss:GO TO 3920
4150 =2: PRINT5,'Fixl plays!':dr=3:bim 1:fenet co
mp$,compsev
4160 arrow comp$,compsev,'Fixl':IF gut THEN coun
t c1,'Fixl'
4170 IF aus THEN neustein comp$,domzahl,compsev:EL
SE IF compsev<5 :aus=1:GO TO 4170
4180 IF NOT compsev THEN pu 3:schluss:GO TO 3920
4190 =3:PRINT5,'It's "name": "turn!":dr=2:bim
1:fenet dein$,seven1
4200 arrow dein$,seven1,name$:IF gut THEN count h
2,name$
4210 IF aus THEN neustein dein$,domzahl,seven1:EL
SE IF seven1<5:aus=1:GO TO 4210
4220 IF NOT seven1 THEN pu 3:schluss:GO TO 3920
4230 =4: PRINT5,'Chipo plays!':dr=3:bim 1:fenet c
omp$,compsev1
4240 arrow comp$,compsev1,'Chipo':IF gut THEN co
unt c2,'Chipo'
4250 IF aus THEN neustein comp$,domzahl,compsev1:
ELSE IF compsev1<5 :aus=1:GO TO 4250
4260 IF NOT compsev1 THEN pu 3:schluss:GO TO 3920
4270 END SELECT
4280 IF ende=5 THEN bim 7:schluss:GO TO 3920
4290 start=start+1
4300 IF start=5 THEN start=1
4310 IF NOT spiel AND start=3 THEN start=4
4320 END REPEAT lily
4330 END DEFine
4340 DEFine PROCedure around(wert$,name$)
4350 PRINT5,'As foundation-stone "wert$(weg)":
Is set by "name$
4360 reihe$(1)=wert$(weg):reihe$(5)=wert$(weg):reihe
$(9)=wert$(weg)
4370 steinleg 1,0,wert$(weg):steinleg 2,0,wert$(weg)
4380 steinleg 3,0,wert$(weg)
4390 PAUSE 150:CLS#3:star=0
4400 welch$='19'
4410 zwait$=wert$(weg):counter(1)=zwait$(2):counte
r(2)=zwait$(2):counter(3)=zwait$(2)

```

```

4410 steinweg wert$,weg
4420 gut=1
4430 END DEFine
4440 DEFine PROCedure arrow (wert$,fiv,name$)
4450 IF star THEN around wert$,name$:IF gut THEN RE
TURN
4460 abst=(INT((fiv/2)+1)*7)-4
4470 AT #3,0,abst:PRINT #3,CHR$(191)
4480 hoch$=4-fiv*7
4490 REPEAT suche
4500 as=INKEY$(1)
4510 IF as=CHR$(192) THEN abst=abst-7:bim 3
4520 IF as=CHR$(200) THEN abst=abst+7:bim 3
4530 IF abst<2 THEN abst=hoch
4540 IF abst>hoch THEN abst=3
4550 sai=(abst+7-3)/7
4560 IF as=CHR$(10) THEN
4570 wai$=wert$(zal)
4580 FOR i=1 TO reihe$(1)-counter(i)OR =
wai$(2)=counter(i) THEN pruef=1
4590 IF NOT pruef THEN
4600 IF ende THEN ende=ende+1
4610 PRINT5,' This stone does not fit !'
:bim 6:PAUSE 50:RETURN
4620 END IF
4630 bim 4:legen wert$,zal:bim 5:CLS#3
4640 pruef=0
4650 RETURN
4660 END IF
4670 IF as=CHR$(32) THEN
4680 IF ende THEN ende=ende+1
4690 aus=1:CLS#3:bim 6:RETURN
4700 END IF
4710 CLS#3
4720 AT#3,0,abst:PRINT#3,CHR$(191)
4730 END REPEAT suche
4740 END DEFine
4750 DEFine PROCedure legen (wel$,zal)
4760 welch$=wel$(zal)
4770 IF dr<3 THEN wheel
4780 flip=1
4790 FOR itt=(sprung-1)*4+1 TO (sprung-1)*4+4
4800 reihe$=reihe$(itt)
4810 IF reihe$<>'xx' THEN
4820 IF reihe$(2)=welch$(1) AND reihe$(itt+1)='xx'
THEN
4830 reihe$(itt+1)=welch$:rei=(INT((itt-1)/#)+1):u
bi=((itt-1) MOD #):ende=0
4840 steinleg rei,ubi+1,welch$:counter(rei)=welch$
(2):steinweg wert$,zal:aus=1:IF ubi=2 THEN gliedern
rei,itt
4850 RETURN
4860 END IF
4870 END IF
4880 END FOR itt
4890 IF flip:zwait$=welch$(1):welch$(1)=welch$(2):w
elch$(2)=zwait$:flip=0:GO TO 4790
4900 gut=0
4910 END DEFine
4920 DEFine PROCedure gliedern (rei,i)
4930 reihe$(i-2)=reihe$(i-1):reihe$(i-1)=reihe$(i
):reihe$(i)=reihe$(i-1):reihe$(i-1)='xx'
4940 WINDOW#50,40,200,fen$(rei),0
4950 FOR i=1 TO 50:SCROLL#50,-1
4960 END DEFine
4970 DEFine PROCedure count (who,name$)
4980 betrag=0:plus=0
4990 FOR i=1 TO 10
5000 betrag=betrag+counter(i)
5010 END FOR i
5020 IF betrag/5=INT(betrags/5) THEN who=who+betrag
ELSE betrag=0
5030 IF echt THEN
5040 IF welch$(1)=0 OR welch$(1)=5 THEN plus=1
5050 IF reihe$<12 THEN IF betrag=0 OR plus THEN IF
welch$(1)=welch$(2):reihe$(reihe$*5+1)=welch$:rei
he$=reihe$+1:counter(reihe$)=welch$(2):steinleg rei
ihen,0,welch$:welch$='19':who=who+betrag:GO TO 498
0
5060 IF betrag THEN
5070 bim 2:PRINT5,name$: ' has got "betrag:" poin
ts
Score: "who:" points':PAUSE 100
5080 ELSE
5090 PRINT5,' That didn't yield points !'
5100 END IF
5110 PAUSE 100:CLS#5
5120 END IF
5130 END DEFine
5140 DEFine PROCedure steinleg (sparte,donde,welch$)
5150 WINDOW#4,40,50,fen$(sparte),(donde)*50
5160 CLS#4
5170 BORDER#4,1,7
5180 lias welch$
5190 CLS#4
5200 druck stein$
5210 END DEFine
5220 DEFine PROCedure wheel

```

```

5230 abst=3
5240 sprung=1
5250 REPEAT susi
5260 IF sprung>reihen THEN sprung=1:abst=3
5270 IF counter(sprung)<welch$(1) AND counter(sprung)<welch$(2) THEN sprung=sprung+1:abst=abst+7:G
O TO 5250
5280 CLS#7
5290 AT#7,0,abst:PRINT#7,CHR$(190)
5300 #=INKEY#(-1)
5310 IF #=CHR$(10) THEN CLS#7: RETURN
5320 IF #=CHR$(200) THEN abst=abst-7:sprung=sprung
-1:bin 3
5330 AT#7,0,abst:PRINT#7,CHR$(190)
5340 END REPEAT susi
5350 END DEFINE
5360 DEFINE PROCEDURE carrow (wert$,sev,name$)
5370 echt=0:hu=0:al=1:score=0
5380 DIM wter(20,2)
5390 IF star THEN echt=1:ground wert$,name$
5400 IF gut THEN RETURN
5410 FOR ci=1 TO sev
5420 welch$(ci)=wert$(ci)
5430 FOR cj=1 TO reihen
5440 IF welch$(1)-counter(cj) THEN
5450 zweit=counter(cj)
5460 counter(cj)=welch$(2)
5470 count hu,name$
5480 wter(zal,0)=ci:wter(zal,1)=cj:wter(zal,
2)=betrag:zal=zal+1
5490 counter (cj)=zweit
5500 END IF
5510 IF welch$(2)=counter(cj) THEN
5520 zweit=counter(cj)
5530 counter(cj)=welch$(1)
5540 count hu,name$
5550 wter(zal,0)=ci:wter(zal,1)=cj:wter(zal,
2)=betrag:zal=zal+1
5560 counter(cj)=zweit
5570 END IF
5580 IF welch$(1)=welch$(2) THEN
5590 IF welch$(1)=counter(cj) THEN
5600 zweit=counter(cj)
5610 counter(cj)=welch$(1)
5620 counter(reihen-1)=welch$(1)
5630 count hu,name$

```

```

5540 wter(zal,0)=ci:wter(zal,1)=cj:wter(zal,
2)=betrag:zal=zal+1
5550 counter(cj)=zweit
5560 counter(reihen-1)=0
5570 END IF
5580 END IF
5590 END FOR cj
5600 END FOR al
5610 echt=1
5620 IF zal>1 THEN
5630 FOR i=1 TO 20
5640 IF wter(i,2)>score THEN score=wter(i,2):s
chritt=1
5650 IF wter(i,1)<0 THEN schritt=1
5660 END FOR i
5670 IF score=0 THEN sprung=wter(schritt,1):legen
wert$,wter(schritt,0):RETURN
5680 sprung=wter(schritt,1):legen wert$,wter(schritt,0)
5690 ELSE
5700 IF ende THEN ende=ende+1
5710 PRINT#5,name$: " is not able to set
stone '':aus=1:bin 6:PAUSE 60
5720 END IF
5730 END DEFINE
5740 DEFINE PROCEDURE bilfe
5750 CLS#3:CSIZE#3,0,1
5760 PRINT#3," One or two persons play against Pi
x1 & Chipo. the clever QL-team! "
5770 PRINT#3," Rules of 'Fiva': Choose stone wi
th cursorkeys and set it fitting to a row from
above (with 'Cursor right' and 'Enter'). You'll g
et points if, after you've set your stone, the sum
of each last number on the last dominoes of all ro
ws is
dividable through five (if e.g. sum=5,35 or
40). If you set a double stone (as 1/1 or 6/6)
then a new row is started (exception: if the sta
rt of the new line with a new number to be a
dded hinders you to get points). May you'll find o
ut, t
he QL-team counts better than you, so be keep
-eyed! "" If you're ready press any
key !"
5780 PAUSE
5790 END DEFINE

```

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# CAMBRIDGE SYSTEMS TECHNOLOGY

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## THOR XVI

The all new CST Thor XVI is a sign of CST's commitment to developing and expanding the QL compatible marketplace and in particular the unique architecture of the operating system. In addition to implementing the full 16 bit bus, David Oliver and his team have gone back to fundamentals to build into the new generation of computers a refined streamlined Qdos compatible operating system: Argos.

While retaining compatibility with Qdos and the QL, the Thor XVI has enhanced networking, single key multitasking, dynamic ram capability of 6.5 Mb with at least twice the performance of the QL. For the professional user there are now 20Mb and 40Mb hard discs complemented by a choice of either single or dual 3.5" floppy disc drives.

To complete your system, CST can supply a choice of monitors and printers; selected from the wide range on the market, their superior performance and reliability when used with Thor computers has led ■ CST's recommendation. The compact Philips 7502 12" monitor for example has many features including a dark anti-glare screen, horizontal/vertical size adjustment, position, brightness and contrast adjustment. For 16 glorious colours on your Thor XVI (in addition to all these features), then the choice must be a Philips 8833 colour monitor.

CST is pleased to satisfy all printer requirements including the installation of the necessary printer driver. The popular Epson LX 800 dot matrix and the fine letter quality Juki 6100 are quoted on the CST price list, for a quote on other models just call CST on 0438 352150.

A recent addition to the software for your Thor, "Discover," by Charles T. Dillon, enables the transfer of data of program files from an alien environment to and from the Thor and QL. This program allows reading from and writing to IBM formatted single or double density 40 or 80 track discs. Fully supporting the subdirectory structures standard in MSDOS and PC DOS operating systems, the program allows the individual selection of files, directories or the whole contents of discs.

### MONITORS

### PRINTERS

### Discover

#### Please supply:-

	UK inc VAT	Overseas
Qdisc Interface 4 (3.5in. util. disc)	£79.95	£72.70
Qdisc Interface 4 (5.25in. util. disc)	£79.95	£72.80
QBF-III Eprom programmer (QL/THOR)	£129.95	£116.00
RAM-plus 512K QL memory	£139.95	£125.20
CST Dual 3.5in. disc floppy discs	£219.95	£200.40
CST Q-488 GPIB instrument interface	£224.25	£198.40
Qdisc 4 + dual 3.5in. drives	£275.00	£249.40
Qdisc 4, RAM-plus + dual 3.5in. discs	£405.00	£383.80
QL SPEEDSCREEN 3.5" <input type="checkbox"/> 5.25" <input type="checkbox"/> mdv <input type="checkbox"/>	£20.00	£18.00

#### The Thor XVI Range

	UK inc VAT	Overseas
Thor XVI CF (Workstation)	£759.00	£759.00
Thor XVI IF (Single Floppy)	£874.00	£874.00
Thor XVI FF (Dual Floppy)	£989.00	£989.00
Thor XVI W20F (20Mb Winchester, 1 Floppy)	£1879.00	£1659.00
Thor XVI W20FF (20Mb Winchester, 2 Floppies)	£1794.00	£1765.00
Thor XVI W40F (40Mb Winchester, 1 Floppy)	£2368.00	£2316.00
Thor XVI W40FF (40Mb Winchester, 2 Floppies)	£2489.00	£2426.00

#### Additional RAM for the Thor XVI Range:

0.6Mb RAM Expansion Card	£179.40	£179.40
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#### For the Thor Range:

	UK inc VAT	Overseas
Philips Monitor (Monochrome)	£292.95	£111.40
Philips Monitor (Colour)	£285.00	£300.40
Belge Mouse	£74.75	£72.00
Psion Chess	£24.95	£22.70
INTRON I from Interlogic	£49.45	£44.00
SPEEDSCREEN rom for Thor	£28.90	£27.00
ROM installation on your Thor	£15.00	
Floppy Discs 3.5", pack of 10	£15.00	£14.00
Additional 12m Service contract (1F&FF)	£100	
Additional 12m Service contract (WFF)	£130	

Please phone for trade-in/leasing details or for standard Thor prices

Export administration Airmails outside Europe

£5.00  
£30.00

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Post Code  Telephone

I enclose a cheque/PO of £

Please deduct my Access/Mastercard/Eurocard/Diners Club/Visa etc

Card No.

Expiry Date

Signature  Date



Prices are inclusive of carriage  
CST reserve the right to alter prices and specifications without prior notice



## THOR GOES INTERNATIONAL

CST have announced the formation of a new sales and support organisation for their products to cover the European market. At a press conference held at the Danish Embassy in London, Thor International was launched as the vehicle to promote CST

products and in particular the Thor XVI. The company's formation, which includes personnel from CST and the Danish software house Dansoft marks the start of a concerted export drive.

In an interview, head of CST David Oliver admitted that he baffled by competitors apparently being forced to manufacture a different machine for each separate export market.

will be loosened." The new company however appears already to have got it's sights set beyond the EEC.

### GLASNOST

"The Thor is a universal machine in every sense and Thor International has been created to capitalise on that fact." Exports currently make up over half of CST's sales and the proportion is steadily increasing with no sign of a turn round despite the recent fluctuations of Sterling.

Oliver's partner in Thor International, Hellmuth O Stuvén added that in addition to building upon a firm foundation in Europe, new markets were also targeted and one that cannot be ignored is the Eastern Block.

A proposed visit to Moscow was mentioned at the press conference and it has since been announced that representatives from Thor International have been invited for a week of negotiations to take place just after copy date. It is hoped that a successful conclusion to the trip will see the signing of a protocol of intent outlining a future joint venture.

### ROLL ON 1992

Oliver added that "at present the most limiting factor to export growth was the ridiculously long wait for export licences which can be in excess of six weeks. Roll on 1992 when at least in Europe the bureaucratic stranglehold



Lucky Peter Freeman with CST's David Oliver receives his prize from Thos Int's Stuvén.

### Dear Hilde...

THOR TIMES  
AGONY AUNT

Dear Hilde,

I bought a Z88 recently to compliment my Thor but am having a bit of trouble with getting them to communicate, all the software I've looked at so far can't seem to cope with the foreign characters I need.

Concerned  
In Communicado.

Dear Concerned,

I must agree these foreign types are a bit of a handful. CST have commissioned Interlogic to take care of them with a full conversion program so you won't be losing any characters with an accent.

Hilde

### WINNER FREEMAN COLLECTS PRIZE

Peter Freeman, lucky winner of the CST competition travelled all the way from Huddersfield to receive his prize at the recent London Microfair. The delighted Freeman was presented a brand new Thor XVI FF worth nearly £1000 by creator of the Thor concept David Oliver together with Hellmuth Stuvén, head of Dansoft and joint founder of the newly launched Thor International.

Mr Freeman was lost for words when CST informed him of his success. A dedicated QL buff and long standing QL World reader. Freeman had been considering upgrading to a Thor for some time, now the decision has been made for him.

## Next Month: PCW Preview



# MICRODRIVE

## KEY

■ = Superbasic; A+O = assembler and object code; M+B = machine code and Basic loader; A+B+O = assembler and Basic loader and object code; S = supercharged; L = QLiberated; I1 = monitor mode; I2 = TV mode

**1. DIY ASSEMBLER** by Giles Todd (B) ■  
A complete two-pass assembler which assembles all 68008 code and supports the directives DRG, END, EQU, DC and DS.

**2. MINI MONITOR** by Richard Cross (A+O) £3  
Multi-tasks on the QL using only 3K of RAM. Commands include dumping registers, memory and ASCII m/c trace, register store, memory move and store, and jumps. *QL User*, October 1985.

**4. GOLF** by Shergold and Toos (B I2) £2  
Up to 50 courses of varying difficulty with lakes, rivers, bunkers and trees. You decide power and direction of each stroke. *QL User*, May 1985.

**5. PALADIN** by Williams and Holdday (A+O) £5  
All-machine code space-invaders game used as the basis of the games programming series beginning ■ April 1985.

**7. PACMAN** by Steve Deary (B) £1  
Almost 20 screens of varying difficulty including an invisible maze. *QL User*, March 1985.

**8. FAMILY TREE** by Andy Carmichael (■) £3  
Archive program and database for assembling and displaying large family trees. *Theory of Relativity*, *QL User*, July/August 1985.

**9. COMPOSER** by James Lucy (L) £3  
Completed in *QL User*, October 1985, this QLiberated program allows you to compose, play and edit music, including tempo, staccato, legato and sharps.

**17. CAD QL** by Tony Quinn (S) ■  
The QL is particularly suited to CAD programs. This version includes rubber banding and user-definable symbols. *QL World*, September 1988.

**19. STARPORT 2001** by Karl Jeffrey (M+B) £3  
Galaxian-style arcade game with fast m/c entry. *QL World*, November 1986.

**24. DESIGN 3D** by J. F. Tydeman (B) ■  
3D screen designs with the minimum of fuss. *QL World*, March/April 1987.

**25. STELLARIS** by D. Carmona (B I1) £4  
Real-time space adventure against the computer, including economic simulations, lunar landing and superb graphics. *QL World*, June 1987.

**29. BRIDGE** by Peter Etheridge (B) £4  
Excellent version including accurate bidding, automatic or manual card play, replay hands, save and load and more.

**32. ADVENT2** by Phillip Sproston (B) £4  
Arcade adventure with humour: rooms, robots and problems to keep you on your toes.

**33. CLOCK** by Leslie Fahidy (B I2) £3  
On-screen clock to set or read the time. Education. *QL World*, June and July 1987; complete program.

**34. QL CONVERSION/CALCULATOR** (I2) £2  
Weights and measures, conventions and reverse Polish, converts anything to anything. Menu-driven, easy to use.

**35. QWERT** by John Wakefield (B) £3  
You play south and the computer plays north against automatic east/west opponents. *QL World*, August 1987.

**36. MAIL MERGE** by Stanley Bykes (B I2) £1  
Handy utilities providing mail merge and tabular for Quil files, plus a demo.

**37. THE DOUBLE** by P. G. Ives (B I2) £4  
A large football strategy game. You manage a team through four divisions, buying and selling, boosting morale through the league and F.A. Cup season.

**38. EDUCATION** by Leslie Fahidy (B) £2  
Teaches the solving of simple linear equations to the 11-plus age group.

**40. ROULETTE** by Santiago Rubio (B) £3  
Spanish/English version of the gambling game, including Leigh Pattern system to break the bank. *QL World*, September 1987.

**41. MONEY** by Leslie Fahidy (B) £2  
An educational shopping trip, calculating prices from shopping lists and working out change.

**42. LIFE** by Neil Davidson (A+■+O I2) £2  
Machine code version of the simulation of a colony ■ cells which live, reproduce or die according to mathematical rules.

**43. OSQUIDGE** by Glassbrook and Swinton (B) £2  
An arcade hunt through an 8 x 8 expandable grid of rooms for the nine parts of Squidge's rocket. *QL World*, October 1987.

**44. COMPRESS** by David Marsh (B) ■  
Utility to compress SuperBasic files without losing the program structure.

**45. SUPERBREAKOUT** by R. Davidson (M+B) ■  
Fast m/c version of the classic bat, ball and wall game. Optional double bats and/or balls.

**46. NAVIGATOR** by Norman Marks (B) ■  
Calculates distance and direction between longitude and latitude points on the Earth. Expandable list of locations.

**47. 3D MAZE** by R. Clements (B) ■  
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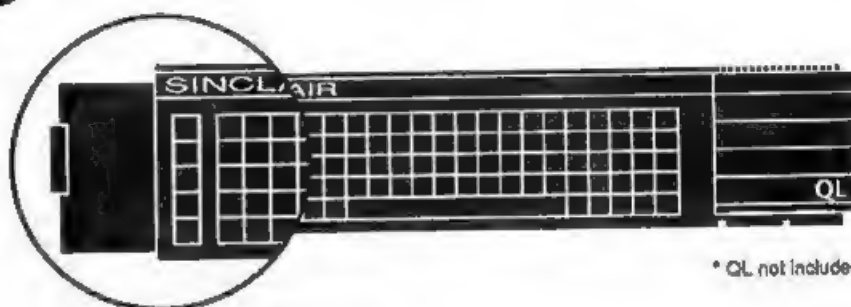
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